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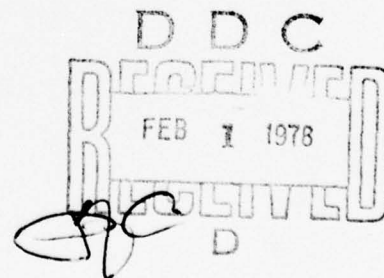
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IMPLEMENTATION PLAN  
FOR AN  
AIR TRANSPORTATION RESEARCH INFORMATION SERVICE



September 1977  
Final Report

Prepared for  
DEPARTMENT OF TRANSPORTATION  
Federal Aviation Administration  
Washington, D.C. 20591





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This report has been reviewed according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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<p>This report presents scope and plans for an air transportation research information service (ATRIS) that would provide the user community with abstracts of documents and resumes of research projects that relate to the air transport field. The general design for the service is similar to that of other Transportation Research Board modally oriented services for highway (HRIS), railroad (RRIS), and maritime (MRIS) research information. Thus ATRIS would not only serve special needs for air transport information, but used in conjunction with the other modal services could provide for full coverage of transportation research information.</p> <p>The potential user community for ATRIS services and products is discussed; recommendations are made for specific types of interactions between ATRIS and the user community.</p> <p>Input scope is presented in terms of twenty-one subject areas and sixteen types of information. Output scope is presented in terms of announcement bulletins, special bibliographies, and batch-mode and on-line retrieval services.</p> <p>The report includes an implementation plan for the first three years of ATRIS development and operations. The plan contains specific proposals for input-output operations in each year, cost estimates for the proposed operations, and funding strategies for meeting the cost requirements through support from sponsors, institutional supporters, and user charges.</p>		
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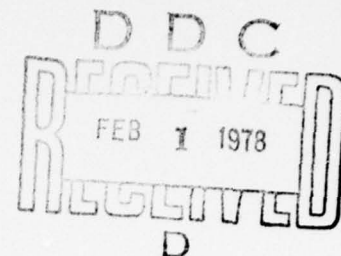
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## FOREWORD

This report has been prepared from discussions and written inputs provided by the Transportation Research Board Committee on Air Transportation Research Information Service (ATRIS), under the chairmanship of John W. Drake. A planning meeting for Committee activities was held on November 12, 1976. Subsequent meetings of the Committee were on January 27, April 15, and July 15, 1977. In the early work four subcommittees developed input material on ATRIS subject areas, information types, information sources, and user requirements. Chairmen of the respective subcommittees were Mr. Horn, Mr. Chan, Ms. Beaver, and Ms. Montle.

During June and July of 1977, the ATRIS Committee reviewed the initial staff-prepared draft and contributed both individually and collectively to the report text and recommendations.

While the Committee recognizes that the plans presented in this report will need updating and modification in the light of changing requirements and technology, the Committee believes that the report provides sound and adequate guidelines for the development and operation of an information service that can provide needed benefits to the user community for air transport research information.

The report is not a specification for further work; it is rather a prospectus for potential sponsors of the service, particularly the Federal Aviation Administration, U.S. Department of Transportation. The report also serves to inform existing information centers and services of the plans that are set forth but is not aimed at prospective individual users. If ATRIS is implemented, appropriate guides and brochures will be prepared for user audiences.

Implementation Plan for an Air Transportation  
Research Information Service (ATRIS)

SUMMARY

This report presents scope and plans for an air transportation research information service (ATRIS) that would provide the user community with abstracts of documents and resumes of research projects that relate to the air transport field. The general design for the service is similar to that of other modally oriented services currently maintained by the Transportation Research Board for highway (HRIS), railroad (RRIS), and maritime (MRIS) research information. Thus ATRIS would not only serve special needs for air transport information, but in conjunction with the other modal services could provide for full coverage of transportation research information.

Justification for the service and benefits provided by the service rest on its uniqueness as a focal point for the assembly of air transport information that is now widely scattered, and as a provider of services and products that are tailored to the needs and wants of the air transport community.

The potential user community for ATRIS services and products is discussed in terms of types of organizations and types of personnel within organizations that represent a target clientele. Recommendations are made for specific types of interactions between ATRIS and the user community, including various forms of publicity and user feedback.

Input scope for ATRIS acquisitions is presented in terms of twenty-one subject areas that range from Aircraft to Travel and Tourism, and in terms of sixteen types of information that include research project resumes, technical reports, planning documents, legislative histories, and air transport regulations.

Output scope is presented in terms of regular announcement bulletins, special bibliographies, batch-mode retrieval service, on-line retrieval service, and other types of services and products for users of air transport information.

The report includes an implementation plan for the first three years of ATRIS development and operations. The plan contains specific proposals for input-output operations in each year, cost estimates for the proposed operations, and funding strategies for meeting the cost requirements.

In the first two Appendixes to the report, details are given for input operations and for output operations, respectively. The third Appendix gives a preliminary list of potential user organizations.

The report represents the collective viewpoints and advice of the Transportation Research Board Committee on Air Transportation Research Information Service; the Committee in turn represents both end users and intermediaries for end users in major sectors of the air transportation field. Support for the development of this report was provided by the Federal Aviation Administration, U.S. Department of Transportation.

## CHAPTER 1. BACKGROUND AND INTRODUCTION

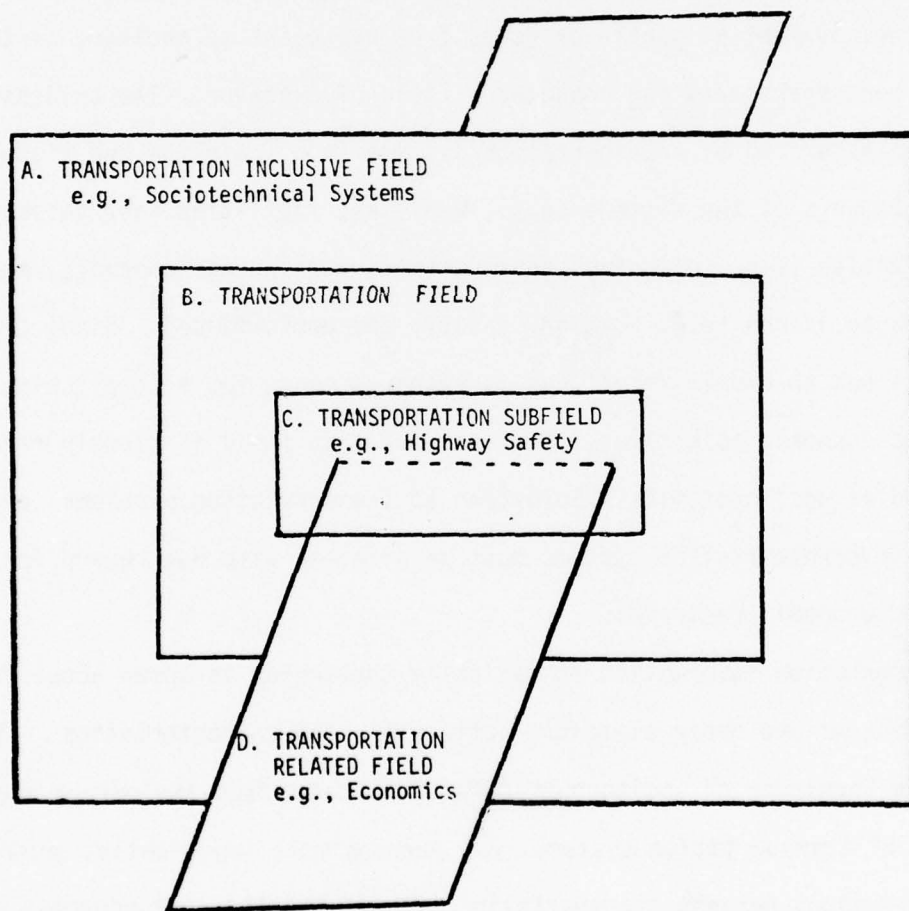
The purpose of this report is to present a detailed plan for the development and operation of a service that specializes in air transport research information and whose goal is to provide effective service to users of air transport research information. This introductory chapter provides background and context for the plan that follows.

It is useful at the outset to discuss concepts that are embodied in the term transportation research information service. Although transportation is literally the movement of people or goods from one point to another, in this report the term transportation connotes a field of endeavor. The transportation field is characterized by transportation systems (e.g., airline and highway systems), elements of the systems (e.g., vehicles, facilities, and passengers), system activities (e.g., planning, construction, and traffic control), and system characteristics (e.g., demand, safety, and performance). Since transportation is not an end in itself but is rather a means for accomplishing societal and economic objectives, the transportation field is closely related to the field of socioeconomics. Solutions to transportation problems and improvements in transportation systems must be attained with due regard for societal and economic restraints.

Transportation information is basically that which is known about transportation systems and their elements, activities, and characteristics. It must also include knowledge of socioeconomic factors that affect the nature and performance of transportation systems, and perhaps more importantly, knowledge of the interactions between transportation systems and the socioeconomic activities they are intended to serve.

As shown in Figure 1 below, a given collection of transportation information might cover (A) the transportation field as part of a larger field such as sociotechnical systems, (B) the transportation field, (C) a transportation subfield such as highway safety, or (D) a transportation-related field such as economics.

Figure 1. Coverage of Transportation Information





The research process consists of organizing, analyzing, and synthesizing information inputs into new forms of information that can be used to help ameliorate problems or to effect improvements. These information inputs can consist of existing information and concepts or intuitions held by the researcher. Research output may consist solely of new concepts or plans, or the research may produce new systems, new components for existing systems, or new facts about existing systems.

It follows that transportation research is the transformation of existing information into new information that is relevant to transportation problems or to the improvement of transportation systems. Transportation research information is sometimes defined as only the output of transportation research, but in this report the term transportation research information includes any input or output information that is associated with transportation research.

#### 1.1 Transportation Research Information Services and Networks

It is perhaps unfortunate that the term information service has two conventional meanings. The term can refer to an organizational unit that serves a given clientele or it can refer to the responses that the organizational unit makes to those it serves. Analogous situations exist throughout the business world where, for example, a service station may perform many types of services for the motoring public. In this report the term information service will connote an information center or an information unit of a larger organization. Whenever the term is used in the second sense, it will be stated as



information services and products, i.e., as output from an information service unit.

The major functions of an information service are to acquire, organize, store, retrieve, package, and transmit in a timely manner relevant information of one type or another. For the purposes of this report, information services can be put in one or another of three major categories. An information service that deals mainly with full-text documents such as books, reports, and journals is a library or document center. Information services in which the preparation of document abstracts or research project resumes is the major function are generally called abstracting and indexing services. A third category of information services consists of retrieval services that neither store documents nor prepare abstracts; these services acquire and store abstracts and/or resumes, then perform batch-mode retrieval service and/or provide on-line access for the users of the service. Any two or all three of these categories of information service may exist at the same information center. Thus a library may also provide abstracting and indexing services; an abstracting and indexing service may also perform retrieval services, etc.

An information service in any of these three categories is a transportation research information service if it covers transportation research information in any of the four categories shown in Figure 1. There are hundreds of transportation research information services within the United States and abroad. Many are units of federal, state, and local governmental agencies, some are units within academic institutions or within businesses or industries, and some are private enterprises.

Information services that are either specific to air transportation research information or that cover a significant part of the field

are exemplified by the following:

Libraries

U.S. Department of Transportation Library, Washington, D.C.  
Northwestern University Transportation Center Library, Evanston, Ill.  
Institute for Transportation Studies Library, University of California,  
Berkeley  
Engineering Societies Library, New York, N. Y.  
Air Transport Association Library, Washington, D.C.  
Civil Aeronautics Board Library, Washington, D.C.  
Air University Library, Maxwell AFB, Alabama  
Port Authority of New York and New Jersey Library, New York, N.Y.  
International Civil Aviation Organization Library, Montreal, Canada

Document Centers

National Technical Information Service, Springfield, Va.  
(U.S. Government reports)  
National Aeronautics and Space Administration, Washington, D.C.  
(NASA reports)

Abstracting and Indexing Services

American Institute of Aeronautics and Astronautics (AIAA)  
Technical Information Service, New York, N. Y.  
National Technical Information Service, (NTIS), Springfield, Va.  
(Abstracts of U.S. Government Reports)  
Engineering Index, Inc. (Ei), New York, N.Y.  
(Abstracts of engineering reports and articles)  
Smithsonian Science Information Exchange (SSIE), Washington, D.C.  
(Resumes of research projects)  
Transportation Research Activities Information Service (TRAIS), U.S. DOT  
(Resumes of ongoing U.S. DOT research projects)

Retrieval Services

TRIS-ON-LINE, Battelle Columbus Laboratories, Columbus, Ohio  
(Abstracts of transportation research reports and articles, and  
resumes of transportation research projects)

Lockheed Information Services, Palo Alto, Cal.  
(On-line access to NTIS abstracts, Ei abstracts, and other data bases)

It may be supposed that a large proportion of all full-text U.S. documents on air transportation are housed in one or more of the libraries and document centers listed above. The abstracting and indexing services and the retrieval services listed, however, cover a much lower proportion of transportation research information than is held by the libraries and document centers.

More complete information about the services listed above is given in the TRISNET Directory to Transportation Research Information Services that was prepared by the TRISNET Secretariat in May 1976 and that is available from NTIS (PB 255 172/AS).

Although the above services cover collectively much of the air transport field, none is both comprehensive and specific with respect to air transportation research information. Implementation of the plan given in this report would provide an abstracting and indexing service that is specific to air transport research information and that is complementary to three existing abstracting and indexing services that now exist for highway research information, railroad research information, and maritime research information. The latter three services were developed by and are now operated by the Transportation Research Board. Summary descriptions of the highway, railroad, and maritime services are given below.

- Highway Research Information Service (HRIS)

HRIS was developed during 1964-1967 at the request of the state highway departments and the U.S. Bureau of Public Roads and operates on an annual budget of about \$500,000. About seventy percent is provided by the States, about twenty percent by the Federal Highway Administration, and about ten percent by other users. Sources of HRIS information include U.S. research organizations, the National Technical Information Service (NTIS), the Smithsonian Science Information Exchange (SSIE),



and the Engineering Index (Ei). Non-U.S. information is acquired through the International Road Federation (IRF) and the OECD International Road Research Documentation (IRRD) network. HRIS services include quarterly publication of HRIS Abstracts, monthly distribution of HRIS current awareness printouts, and weekly response to requests for batch-mode retrievals. More than 3,000 user organizations now receive HRIS services. Approximately 40,000 HRIS records that have been stored since 1970 are available to users of the TRIS-ON-LINE retrieval service provided by Battelle Columbus Laboratories (BCL).

- Maritime Research Information Service (MRIS)

At the request of the Maritime Administration, U.S. Department of Commerce, TRB began the development of a Maritime Research Information Service (MRIS) in 1969. At present the MRIS data base contains about 13,000 abstracts of research reports and articles and about 200 resumes of ongoing maritime research projects. The annual MRIS operating budget is about \$240,000 of which about seventy-five percent is provided by the Maritime Administration and about twenty-five percent by other MRIS users. MRIS services include semiannual publication of MRIS Abstracts, monthly publication of MRIS Current Awareness, and weekly response to requests for batch-mode retrieval. About three hundred organizations now subscribe to MRIS services. Sources of MRIS information include U.S. research organizations, NTIS, SSIE, and Ei. Non-U.S. information is acquired through exchange agreements with the British Ship Research Association and the Norwegian Ship Research Institute.

- Railroad Research Information Service (RRIS)

In 1972 TRB began the development and operation of the Railroad Research Information Service (RRIS) at the request of the Federal Railroad Administration. The RRIS data base now contains about 13,000 abstracts of research reports and articles and more than 500 resumes of ongoing railroad research projects. The annual operating budget for RRIS is about \$200,000 of which about seventy-five percent is provided through contract with FRA; about twenty-five percent is provided by other RRIS users. About 800 organizations now subscribe to RRIS services that include semi-annual publication of the Railroad Research Bulletin and weekly response to requests for batch-mode retrieval. The RRIS data base is made available to users of the TRIS-ON-LINE retrieval service. Sources of RRIS information include U.S. research organizations, NTIS, SSIE, and Ei. Non-U.S. information is acquired through an exchange agreement with the International Union of Railways (UIC) in Paris.

Since the public transportation mode is within the joint scope of HRIS and RRIS, and since MRIS can cover research information on inland waterways, addition of an ATRIS would provide an ensemble of abstracting

and indexing services that collectively can cover all transportation modes and all types of transportation research information.

In response to overall user requirements a given modal service may use selection criteria that minimize coverage of certain aspects of the modal field. For example, HRIS emphasizes the roadway and user aspects of highway research and minimizes its coverage of automobile research. Thus complete coverage of the transportation field by a modal ensemble may require scope adjustments by each element of the ensemble.

With support from the Office of the Assistant Secretary for Systems Development and Technology, DOT/TST, a TRB Committee on Transportation Research Information Services worked during 1971-1976 to develop extensive plans for a U.S. network of transportation research information services (TRISNET). Concepts and general design for the TRISNET were reported in 1975 (1). It was conceived that the network would include four components:

- Abstracting and Indexing Service (AIS) Component

A set of abstracting and indexing services whose collective and cooperative efforts can cover all transportation research documents and all ongoing transportation research projects. Major elements of the AIS component would be HRIS, RRIS, MRIS and the prospective ATRIS.

- TRIS-ON-LINE Component

An on-line data base that contains the non-overlapping holdings of the AIS Component and from which on-line retrieval services are provided to all elements of the transportation research community.

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(1) Design Concepts for a National Network of Transportation Research Information Services (TRISNET), Transportation Research Board, Washington, D.C.  
NTIS PB 245 311/AS



- Document Delivery Service (DDS) Component

A set of libraries and document centers whose collective holdings include all documents whose abstracts appear in the TRIS-ON-LINE component and whose cooperative efforts provide document delivery services upon request by the user community.

- Coordination and Communications Component (CCC)

A component that provides for management and coordination of the other TRISNET components, for overview of TRISNET development and operations, and for communications within the network and between the network and the user community. Elements of this component are a TRISNET Manager, a TRISNET Overview Committee, a TRISNET Managers Council, and a TRISNET Secretariat.

Although considerable progress has been made toward implementing various elements of the network, there have as yet been no commitments for continuing and stable funding of network operations. Moreover, there does not yet exist a set of firm agreements among the prospective service elements of the network.

## 1.2 History of ATRIS Development

In each annual report of the TRIS Committee there appeared a recommendation for the development of an abstracting and indexing service that would specialize in air transport research information and that would complete the modal ensemble represented by HRIS, MRIS, and RRIS. In June 1974, the Transportation Research Board brought together an ad hoc group of about fifteen people to discuss the desirability of and possibilities for ATRIS. The agenda included a discussion of input scope and a discussion of the potential user community and its information requirements.

The group learned that the Flight Transportation Laboratory (FTL) at MIT had been building a data file on air transport research information under the direction of Professor Robert W. Simpson. This file contained

two or three thousand references, in a machine-readable form, to information within seven general subject categories: Aircraft, Airlines, Airports, Air Traffic Control, Travel Demand, Transportation Systems, and Operations Research.

One consequence of the meeting was that FTL and TRB collaborated, with support from DOT/TST, to store about 1500 of the FTL references in the TRIS-ON-LINE data base that was then in its initial stage of development. A second consequence was that the Federal Aviation Administration invited the Transportation Research Board to submit a proposal for producing a plan for ATRIS implementation and for producing a prototype product. In September 1976, a one-year contract between FAA and the National Academy of Sciences was negotiated. The statement of work included the following six tasks:

- (a) Establish an ATRIS Committee to represent major sectors of the air transport research community.
- (b) Identify the total scope of ATRIS in terms of subject areas, information types, acquisition sources, potential users, and services and products.
- (c) Prepare an implementation plan for ATRIS development and operation.
- (d) Identify a relatively narrow subject scope for a prototype bibliography.
- (e) Acquire, process, and store up to 1,000 abstracts of documents relevant to the subject(s) identified in task d.
- (f) Produce camera-ready copy for the prototype bibliography, including a user response form that publicizes ATRIS development and that solicits suggestions for future ATRIS products.

Performance of Task (a) is represented by the ATRIS Committee roster contained on page ii of this report. The remaining chapters of this report represent performance of Task (b) and Task (c).

In response to Task (d) the ATRIS Committee identified certain issues and problems associated with airports to be an appropriate scope for the prototype bibliography. Task (e) was performed jointly by the FTL and TRB, and Task (f) was performed by TRB.

In summary, the present report is the culmination of more than three years of discussions and recommendations on the development of an information service specific to the field of air transportation. Justification for the service and benefits provided by the service rests on its uniqueness as a focal point for the assembly of air transport information that is now widely scattered and as a provider of services and products that are tailored to the needs and wants of the air transport community.

## CHAPTER 2. POTENTIAL USER COMMUNITY FOR ATRIS

It is clearly wasteful to design and implement an information service that is not used by those for whom the service was intended. It can be argued that the design for ATRIS input/output operations must be preceded by a marketing study of the user community and that ATRIS should be implemented, or not implemented, in the light of the study results. On the other hand, the results of a marketing study may not be conclusive unless prospective users can see and experience the specific products and services that are being offered. The substance of this chapter has not been synthesized from the views and opinions of what may be hundreds or even thousands of potential users of ATRIS services and products; it is based on the collective reasoning of the ATRIS Committee and on accumulated experience of similar information services that are now operational (e.g., RRIS).

It is important to distinguish between the user community for air transport research information and the users of ATRIS services and products. It is the first of these two groups that will be addressed in this chapter; the second group cannot be named until ATRIS services and products are available for use. It is assumed throughout, however, that there are many present users of air transport research information and that all are potential users of ATRIS products and services.

The potential user community for any type of information service is "chicken and egg" with the input/output scope of the service. A relatively narrow input scope may match the information needs of only a handful of users; if the input scope is too wide and diffuse, the service may not be able to match specific needs of any users. For a given input scope, a range of output services and products is generally needed to match the wants and needs of potential users.



## 2.1 Classification of Potential Users by Type of Organization and Type of Work

As background for the subsequent discussion of user wants and needs for information services and products, it is useful to identify the types of organizations within which users of air transport research information are most likely to be found and to identify the types of work that are most likely to require access to air transport research information. Types of organizations and types of work that constitute the potential user community for ATRIS are listed in Table 1. Since the categories are quite general it is reasonable to suppose that virtually all users of air transport research information are accounted for by the categories shown. Appendix C to this report gives an initial list of specific organizations that fall in one category or another, but it will require additional effort to approximate the universe of U.S. and non-U.S. user organizations and to identify one or more individual users within each user organization. This further effort will be a necessary step to insure adequate marketing and publicity coverage for future ATRIS development.

One initial step has been taken toward identification of ATRIS users. The 50 state departments of highways and transportation all receive HRIS services, and most receive RRIS and MRIS services. In early 1977 each department was asked whether it will wish to receive ATRIS publications if and when such become available. The results to date are that 44 of 45 responding States do want to receive ATRIS services when available.

After potential users in other categories of Table 1 have been identified, and after one or more ATRIS services and products become available, similar studies can be made of other categories in Table 1. The results would reveal the relative interest in ATRIS among the various categories of the overall community. To date, for example, 44/50 or 88



Table 1. Classification of Users of Air Transport Research Information

TYPES OF ORGANIZATIONS	
1. FEDERAL AND STATE AGENCIES (US and Non-US)	3. BUSINESS AND INDUSTRY (US and Non-US)
1.1 Transportation Agencies 1.1.1 Policy & Planning Groups 1.1.2 Research & Development Groups 1.1.3 Other Groups (includes safety/accident investigation)	3.1 Air Carriers 3.1.1 Forecasting/Planning Groups 3.1.2 Engineering/Operations Maintenance Groups 3.1.3 Traffic Groups 3.1.4 Marketing, Legal & Finance Groups
1.2 Environmental Agencies 1.2.1 Policy & Planning Groups (abatement controls/regulation) 1.2.2 Research Groups (noise and emissions/human response) 1.2.3 Resource Preservation (land use planning/controls)	3.2 Manufacturers, Contractors, & Suppliers 3.2.1 Aircraft 3.2.2 Engines 3.2.3 Components (landing and navigation aids) 3.2.4 Fuels & Services
1.3 Energy Agencies/Offices 1.3.1 Policy & Planning Groups (allocation programs) 1.3.2 Research Groups (energy conservation/efficiency)	3.3 Consulting Firms 3.3.1 Economics Consultants 3.3.2 Engineering Consultants 3.3.3 Planning & Research Consultants
1.4 Commerce Agencies 1.4.1 Industrial & Economic Development Plans & Programs 1.4.2 Promotional Groups (recreation/tourism/trade)	3.4 Organizations/Associations 3.4.1 Air Carrier Groups 3.4.2 General Aviation Groups 3.4.3 Manufacturers Groups 3.4.4 Shipper/user Groups 3.4.5 Labor Groups
1.5 Regulatory Agencies and Authorities 1.5.1 Economics and Operations (routes & fares) 1.5.2 Statistical Services	3.5 Banking & Investment Firms 3.5.1 Banks 3.5.2 Investment Underwriters 3.5.3 Insurance Companies 3.5.4 Leasing Companies 3.5.5 Investment Research Firms
1.6 Military Organizations	3.6 Operators of Ground or Water Transport Systems
1.7 Other Agencies 1.7.1 Executive and Legislative Staff Support Groups 1.7.2 Budget Office 1.7.3 Special Commissions and Task Force Groups	4. ACADEMIC INSTITUTIONS AND PROFESSIONAL SOCIETIES (US and Non-US)
2. REGIONAL AND LOCAL AGENCIES (US)	4.1 Universities (Libraries)
2.1 Policy and Planning Agencies for Comprehensive & Multimodal Transport 2.1.1 Regional Planning & Development Boards 2.1.2 Councils of Government 2.1.3 Metropolitan Planning Organizations	4.2 Research Institutes
2.2 Operating Authorities for Aviation & Multimodal Transport 2.2.1 Port Authorities 2.2.2 Regional/Metropolitan Transportation Authorities 2.2.3 Airport Authorities and Aviation Departments	4.3 Professional Societies

TYPES OF WORK	
A. Administration & Management	I. Library & Information Services
B. Aviation Analysis	J. Market Analysis & Forecasting
C. Design	K. Operations
D. Development	L. Planning
E. Economic Analysis	M. Policy Formulation
F. Education	N. Research
G. Engineering	O. Safety & Security
H. Legal	P. Scheduling

percent of the state departments have interest in ATRIS publications.

Publicity and marketing lists for RRIS and MRIS each contain around 2,000 U.S. organizations. Publicity for HRIS reaches about 5,000 organizations on a world-wide basis. Thus it may be supposed that the potential user community for ATRIS includes from two to three thousand organizations. There may of course be a number of individual users within any user organization. Table 2 shows the number of subscribers to HRIS, MRIS, and RRIS publications in 1976, and in categories similar to those of Table 1.

Table 2. Distribution of Subscribers to HRIS, MRIS, and RRIS Publications  
(As of October 1976)

Organization Type	Information Service		
	HRIS	MRIS	RRIS
Federal Agencies	298	47	128
State & Local Agencies	1,305	37	115
Business & Industry	330	98	303
Academic Institutions	429	38	98
Other Types	101	22	87
Totals	2,463	242	731

User Office	Information Service		
	HRIS	MRIS	RRIS
Administration	478	33	224
Technical	1,352	53	134
Library	431	90	170
Other Offices	202	66	203
Totals	2,463	242	731
U.S. & Canada	2,190	242	659
Other Countries	273	0	72

The distributions shown in Table 2 are for individual persons or individual offices within organizations. Neither the actual number of different organizations nor the overlap in subscribers among services has been analyzed at the present time. It is estimated that between ten and twenty percent of all potential user organizations do in fact subscribe to the respective services, and that multiple subscriptions are received by at least half of the subscribing organizations.

Until market research for ATRIS output has been performed, it is only possible to speculate on the numbers that might appear in ATRIS columns for Table 2. A preliminary estimate is that the distribution of ATRIS users will be similar to the combined non-overlapping distributions of MRIS and RRIS users.

Finally it should be noted that Table 2 refers to service publications and that any publication issue may be used by several individuals within the subscribing organization. User surveys of HRIS and RRIS subscribers have shown that an average of about five different individuals use regularly the publications received through a single subscription. Multiplication of the Table 2 totals by five provides round number estimates of about 12,500, 1,200, and 3,600 individual users of HRIS, MRIS, and RRIS publications, respectively.

Users of HRIS, MRIS, and RRIS batch-mode retrieval services are essentially subsets of the publication subscribers. In 1976 approximately 1,000 retrievals were made for HRIS users, about 200 for RRIS users, and about 100 for MRIS users. The distributions of on-line retrievals through TRIS-ON-LINE are not available at this time, but in 1976 approximately 60

user terminals were in operation for varying lengths of time.

## 2.2 User Needs and Wants for Air Transport Research Information

If it is hypothesized that there are 2,000 organizations in which there is an average of five individual users of air transport research information, then there would be 10,000 users. A comprehensive study of those users could reveal not only their present needs and wants, but also their present information practices and the degree to which present practices satisfy the needs and wants. Such a study would presumably provide inferences on what ATRIS would have to be like if it is to serve a useful purpose and provide needed benefits. Two studies of this type have been conducted under the auspices of the TRIS Committee, and each of HRIS, MRIS, and RRIS have surveyed their respective users on certain questions about user needs, wants, practices, and levels of satisfaction. None of these studies, however, included significant numbers of users of air transport research information, and none were designed to produce valid inferences about a well defined universe of information users that includes both users and non-users of particular information services.

Although first-hand responses from the community of users of air transport research information are not yet available, it is useful to pose and discuss the questions that are raised in the remainder of this topic. The discussion under each question represents ATRIS Committee deliberations except for statements that are attributed to prior studies.

*Question 1. Do experts on a given subject go to a service such as ATRIS to acquire information in their own areas of expertise*

Experience shows that experts do use information services that cover their own areas of expertise. On the other hand it may be that the greatest



value of an information service is realized by users who need to keep abreast of developments outside their own areas of expertise or who have needs for specific information in fields other than their own. Within the air transport field, for example, technical people might realize more benefits from ATRIS information on the socioeconomic aspects of air transport than from ATRIS information on air transport technology.

*Question 2. Does any particular group of users have some unique set of requirements such that ATRIS should be tailored to the needs of specific groups?*

Until market research and experience shows otherwise, there is no indication that ATRIS should be tailored or customized on behalf of one or more subsets of the potential user community (Table 1). There may be a wide range of information needs and wants among users, but it appears likely that this range would exist in any sizable subset of the user community. This range of needs and wants should be covered, however, by the range of ATRIS input and by the range of ATRIS services and products.

*Question 3. Do users expect or desire complete recall on a given topic or subject, or do they prefer a representative response of selected information on the topic?*

The answer to this question depends on whether the user's need is for a sample or a census of information that exists on the subject. Through input selection the quality of sample responses can be increased but at the risk of omitting useful material. The census approach reduces the latter risk but introduces significant increases in the cost of all operations, including the screening of low quality information. If funding is available, the census approach should probably be taken since samples can always be generated from a census but not vice versa. Another approach is to provide complete recall for information represented by certain types or sources of information (e.g., DOT reports) and sample

recall for other types or sources (e.g., non U.S. journal articles).

Question 4. *What are the major overall requirements of users?*

Two general information needs are (a) to keep informed of recent events and results in one or more subject areas and (b) to acquire information that is relevant and specific to a particular question. The first is a browsing requirement, the second is a retrieval requirement. The type and frequency of need varies greatly among different users and often varies for any single user. User satisfaction with the response to either type of requirement can be greatly influenced by the timeliness, completeness, and relevance of the information received.

Question 5. *Why will ATRIS be used?*

It is expected that ATRIS will be used because its information scope corresponds to the continuing concerns and information needs of hundreds of organizations within the air transport community. It is also expected that ATRIS will be used by organizations and individuals who may not specialize in air transportation but who have intermittent needs for air transport research information. Use of ATRIS in either case implies that the service provides convenient and economical access to air transport information and that the service is responsive to the user's needs.

Question 6. *What proportions of user needs will require access to information on other modes in addition to air transport?*

There have been no good analyses of this question. On the input side it appears that about 80 percent of transportation documents are oriented toward one mode or another and that the remaining 20 percent relate to several or all transport modes. It also appears that at least one-half of all organizations that have concern for transportation research information are modally oriented. Even if the majority of ATRIS

users are mainly concerned with air transport, it is desirable to provide all ATRIS users with easy access to the information in other transport modes. Specifically, the information held by any or all of the HRIS, RRIS, and MRIS services is now readily available to the users of any one of the services; ATRIS information will be similarly available.

Question 7. *What trends can be expected for on-line use of the ATRIS data base?*

On-line access is not practical for meeting the browsing requirements of users but is extremely effective for meeting retrieval requirements. It appears that within the next two years virtually all libraries will be equipped for on-line access and will therefore perform on-line searches on behalf of their respective constituencies. User organizations that do not have libraries fall into two categories (a) those whose retrieval needs include fast response, say, from one hour to one day, and (b) those whose retrieval needs are met by responses that range from one to two weeks. It can be expected that users that require fast response will turn to on-line access, and that the remaining users will either request batch-mode retrieval service or will arrange for on-line retrieval service from other organizations. In the industry category a substantial majority of organizations now use on-line retrieval. It appears that at least half and perhaps as many as three-fourths of all major user organizations will use on-line access within the next two or three years.

Question 8. *How are the hard-copy products of an information service used?*

Surveys of HRIS and RRIS users indicate that hard-copy products are used by technical specialists mainly for browsing and by libraries mainly for manual retrieval.

Question 9. *How do users now meet their needs for air transport research information?*

In a survey sponsored by the TRIS Committee, about half of 800 respondents depend mainly upon technical publications, trade journals, and direct

personal communications to keep abreast of current transportation developments. Nearly two-thirds first turn to some other person to acquire information on a specific subject. About forty percent ask first for library assistance.

*Question 10. Is it expected that the ATRIS clientele will be largely individual users or largely organizational users?*

Many user organizations have librarians or other information "gatekeepers" who assist other members of the organization to meet information requirements. In all these cases the intermediary would be the direct user of ATRIS services and products. Based on the experience of HRIS, RRIS, and MRIS it can be expected that one-half to two-thirds of ATRIS users will be intermediaries that serve other members of their respective organizations.

*Question 11. What types of information would users expect to see covered by ATRIS?*

Users would expect ATRIS to have a well-defined coverage of the technical literature and other substantive reports and papers on air transportation, including policy and planning documents. On a much more selective basis, ATRIS would provide references to articles from trade journals and to information generated by legislative, regulatory, and transportation-related agencies. Selective coverage of non-U.S. information would be expected, but mainly for documents that are available in the English language. The scope of ATRIS coverage is discussed in Chapter 3.

*Question 12. What are the most important user acceptance criteria for ATRIS services and products?*

Answers to this question are generally much the same for any information service. Users expect adequate and timely coverage of the input scope; they expect high quality, reliable, responsive, and economic output services. Given the particularly rapid changes in the field of



air transportation as a whole, the ATRIS file should be kept as current as possible. Users expect the service to have a purging policy for information that is obsolescent or that has otherwise lost its value. It is important to provide users with simple procedures for acquiring full-text documents and equally important that the document delivery service be timely, reliable, and economic.

Question 13. *In what ways should ATRIS provide statistical and other numerical data to users?*

A set of numerical data should be treated as though it were a document, whether the data set is in fact contained in a document or whether the set exists only in machine-readable form. If a given data set is within the ATRIS scope and if its contents meet ATRIS selection criteria, then it should be represented by a record in the ATRIS master file. The record would contain index terms and an abstract that describes the major features of the data set and would inform the user on how the data set may be acquired.

Question 14. *What can be said about long range use of ATRIS services and products?*

Some insight into the potential future use of ATRIS may be gained from a general observation of the air transportation industry as a whole. It seems inevitable that the various segments of the air transportation community will be subjected to much closer scrutiny by decision makers, policy makers, political leaders and the general public. As air travel grows, its impacts upon society likewise grow and various societal constraints begin to be imposed. Pressure is being felt for better planning and more enlightened decision making. As an example of a response to this pressure, state highway departments are reorganizing as transportation departments and these departments are slowly becoming truly multimodal. Regional and local planning agencies, transportation authorities, and

other comprehensive planning and development agencies in all levels of government are also giving more attention to air transportation problems. Much of the increased attention is focused upon the airport—the interface between the air transportation system and the community. For these and other related reasons, it appears that there will be an increasing need for air transport research information. If ATRIS is responsive to these needs, the use of ATRIS services and products can also be expected to increase.

In summary, there are many unknowns and few hard facts about the potential user community for ATRIS services and products. It is recommended that the two products of the first year's effort (this report and the prototype bibliography) be used as a basis for systematic and in-depth studies of the questions that have been raised and thereby amplify and modify the tentative answers that have been given in this chapter.

### CHAPTER 3. INFORMATION SCOPE FOR ATRIS

The single most important characteristic of an information service is its information scope. On the input side, information scope refers to the types of information that are acquired, the sources of the acquired information, and the extent to which various subjects are covered. Information on a given subject (e.g., aircraft noise) can appear in many forms (e.g., news items, research reports, or textbooks); a given type of information (e.g., journal articles) might cover all subjects in a given field such as air transportation.

An information service may have several types of output information (e.g., citations, abstracts, and documents). Both the input scope and the output scope of a service are critical determinants of the types of users, number of users, and level of use that the service will experience. Both are functions of user requirements and available funds.

#### 3.1 Subject Scope

Subject scope can be described at the level of subject areas that are broad subdivisions of the total subject scope or at the level of an indexing vocabulary that covers the total subject scope in very fine and specific detail. The field of engineering, for example, might be covered by perhaps ten or twenty types of engineering (e.g., civil, aeronautical, or mechanical). The specific vocabulary for all engineering concepts may, however, require ten thousand or twenty thousand terms.

Subject areas can serve several purposes: to give users a quick feel for the subjects that are covered, to subdivide large quantities of output into more readily used subsets, and to provide a basis for selective dissemination in broad areas of interest. On the other hand, index terms are the retrieval "handles" on stored information; they are the basis for

searching out information that is relevant to a very specific concept such as airport runway roughness measurements. The distinction between subject areas and index terms is analogous to the difference between the chapter headings of a textbook and the detailed index at the end of the book.

The subcommittee on ATRIS subject areas examined a number of subject area lists that have been used for various collections of air transport information, including those used by DOT Library's 10-A Services Branch and by the MIT FTL Data File. The ATRIS Committee recommends that the twenty-one subject areas shown in Table 3 be the initial basis for subject classification of ATRIS input material. For each subject area from Aircraft to Travel and Tourism, Table 3 contains a number of index terms that are indicative of the scopes of the respective subject areas. Thus, for example, the table shows that the scope of subject area 20 on Security includes airports, baggage, bombs, cargo, and theft. This example shows that subject area names can also be index terms. Thus airports is shown as an index term under the Security subject area, and security is shown as an index term under the Airports subject area.

It can be seen that the recommended subject areas cover both air transport technology and socioeconomic aspects of air transportation.

It is quite likely that further refinement or expansion of ATRIS subject areas and index terms will occur after sufficient experience has been acquired to reveal weaknesses and shortcomings of the initial list.

### 3.2 Types and Sources of Information

The term information type will be used for characteristics of an information unit (e.g., a report or an article) that are independent of its subject content.



Table 3. ATRIS Subject Areas

01 AIRCRAFT

Accidents; Avionics; Cost of Operations; Flight Equipment & Engine Data; Flight Simulators; Fuel Requirements; Leasing; Maintenance; Navigation Systems; Noise; Operations; Pollution; R&D; Safety; Type

02 AIRLINES

Agreements; Economics; Enforcement; Facilitation; Fares & Rates; Federal Regulation; Finance; Fleet; Management; Merger; Performance Measures; Personnel; Routes; Scheduling; Use

03 AIRPORTS

Airside Capacity; Design; Economic Impact; Economics; Environment; Finance; Landside Access; Laws & Regulations; Management; Runways; Security; Statistics; Terminal Facilitation; Traffic Forecasts

04 AIR FREIGHT

Automated Systems; Containerization; Costs; Distribution/Handling; Demand; Regulation; Sales; Tariffs & Rates; Use

05 AIR TRAFFIC CONTROL

Air Space Utilization; Approach & Landing; Collision Avoidance; Communications; Economics; Enroute Control; Enroute Navigation; Flight Service; Flow Control; Operations Research; Radar; Safety; System Support; Terminal/Tower

06 ECONOMICS

Capacity Control; Competition; Costs; Discount Pricing; Diversification; Elasticities; Fares & Rates; Load Factor; Long Range Planning; Operating Efficiency; Operations Research; Peaking; Pricing; Productivity; Regulatory Reform; Scheduling; Short Haul Markets; Traffic Forecasting; User Charges; Utilization

07 ENVIRONMENT

Airport/Aircraft Interface; Airport/Community Interface; Atmospheric Pollution; Federal Regulations; Land Use Planning; Legislation; Monitoring Systems; Noise Abatement Procedures; Routing; Technology R&D

08 FACILITATION

Documentation Management; Entry & Departure of Aircraft; Entry & Departure of Cargo & Other Articles; Entry & Departure of Persons; Facilities & Services for Traffic at International Airports; Government Procedures; Intermodal Systems Management; International Cooperation

09 FINANCE

Accounting; Capital Requirements; Cash Generation; Cost Allocation; Financing; Insurance; Leasing; Loan Guarantees; Return on Investment; Revenues; Subsidies; Taxes; User Charges

10 FORECASTS

Aircraft; Airport & Airways Facilities; Capital Requirements; Domestic Cargo; Domestic Passengers; Economics; International Cargo; International Passengers; Methodologies

11 FUELS

Allocation; Conservation; Consumption; Efficiency of Use; Forecasts; Imports; Prices; Specifications; Supply

12 GENERAL AVIATION

Accidents; Activity; Airports; Economics; Exports; Fleet; Fuel Requirements; Production; Use

13 GOVERNMENT POLICY, PLANNING, REGULATION

Aviation System Planning; Airports; Airways; Charters; Domestic Policy; Economic Regulation; International Policy; Legislation; Mail; Mergers; Military/Civil Defense; Routes; Safety; Service to Small Communities; Subsidies; Taxes; User Charges

14 MARKETING

Advertising; Baggage Handling; Commissions; Consumer Relations; Credit; Discounts; Market Research; Reservations; Sales; Schedule Publications; Simulation Models; Ticketing

15 METEOROLOGY

Atmospheric Conditions; Fog; Forecasting; Instruments; Meteorological Radar; Satellites; Weather Stations

16 NAVIGATION

Collision Avoidance; Enroute; Landing Aids; R&D; Systems; Visual Aids

17 PASSENGER DEMAND

Elasticity; Forecasts; Peak & Off-Peak; Quality of Service; Seasonality; Statistics; Surveys

18 PERSONNEL

Costs; Education; Management; Manpower Requirements; Performance Measures; Productivity; Recruitment; Statistics; Unions

19 SAFETY

Accident Prevention Programs; Accident Reports; Causes; Decisions; Government Regulation; Human Factors; Investigative Methodology; Pilot Certification

20 SECURITY

Airport; Baggage; Bombs; Cargo; Hijacking; Mail; Metal Detectors; Security Guards; Terrorism; Ticket Stock; Theft

21 TRAVEL AND TOURISM

Demand; Development; Economic Impact; Economics; Environmental factors; Sociological Trends; Statistics; Travel Agents

One question that can be asked about any information item is whether it is primary information or secondary information. Although the definitions are not precise, primary information is complete in itself (e.g., a book, report, or article) and is often said to be a full-text document. Secondary information is information about primary information (e.g., a citation, abstract, or index); secondary information is thus surrogate for one or more items of primary information. In this report a research project resume will be considered as secondary information even though it is not surrogate for a full-text document, rather it is surrogate for a research project.

Another dimension for information type is represented by the physical nature or form of the information item. Common examples are printed text, graphic materials, microfilm or microfiche, and machine-readable forms such as punched cards, magnetic tapes, or magnetic disks.

Information types and information forms are closely related to the sources from which information is acquired. Thus some sources provide only one type of information in one form, some sources provide several forms for the same type of information, and several sources provide many types of information in different forms.

Eight types of primary information and eight types of secondary information have been identified as a basis for acquiring ATRIS input. These types are listed in the first column of Table 4. For each type, the second column of Table 4 gives sources from which the information may be acquired and indicates the probable form in which the information is available to ATRIS.

Acquisition of each type of information should be based on agreements between ATRIS and the sources from which the information is acquired. The

Table 4. Types and Sources of Information for ATRIS Input

1. Types of Primary Information on Air Transportation	Major Sources of Primary Information (generally in hard-copy form)	Approximate Percentage of Combined HRIS, RRIS and MRIS Files
a. Reports not covered by secondary acquisitions (Includes policy and planning documents)	a. (1) GPO, (2) State & Local Agencies, (3) Consultants, (4) Industry, (5) Research Institutions, (5) Other Information Centers	9
b. Journal Articles & Conference Papers not covered by secondary acquisitions	b. (1) Publishers/Subscriptions (2) Library Loans	8
**c. Accident Reports	c. (1) NTSB	0.1
**d. Legislation, Regulations, Orders Legislative Histories	d. (1) CAB (2) Congressional Publications	0.3
**e. Hearings	e. (1) Federal Register (2) GPO (3) Congressional Publications	None
*f. News Items, Editorials, Magazine Articles	f. (1) Magazines/Trade Journals (2) Newspapers/Newsletters	2
**g. Statistical Data Sets	g. As for Item 2a	0.4
**h. Computer Programs	h. As for Item 2a	0.2

2. Types of Secondary Information on Air Transportation	Major Sources of Secondary Information and Probable Acquisition Forms	Approximate Percentage of Combined HRIS, RRIS and MRIS Files
a. Resumes of Research Projects	a. (1) SSIE (magnetic tape) (2) TRAIS (magnetic tape) (3) Sponsor Agencies (e.g., FAA) (4) Performing Agencies (e.g., Consultants)	7
b. Abstracts of U.S. Government Reports	b. (1) NTIS (magnetic tapes) (2) NASA (printed abstracts)	15
c. Abstracts of Journal Articles, Conference Papers & Conference Proceedings	c. (1) Engineering Index (magnetic tape) (2) AIAA (printed abstracts)	12
d. Abstracts of Reports & Articles not included in b or c	d. Through agreements with other information centers and services in the U.S. and abroad (e.g., ATA, ITA, ICAO, IATA, U.S. Travel Service, HRIS, ...)	45
e. Special Bibliographies	e. Council of Planning Libraries	1
f. Citations & Catalog Data that identify primary information for acquisition	f. (1) DOT Library 10A Catalog (2) Library Acquisitions Lists (e.g., Northeastern University Library)	These acquisitions are not stored. They are used to locate information not acquired through the major sources
g. Indexes to Primary Information and to Sources of Primary Information	g. (1) World Aviation Directory (2) GPO Catalogs (3) Bulletins of Other A&I Services	
h. Bibliographic Data Bases	h. On-Line Services (e.g., Lockheed, SDC, BRS)	

\* Selection by Exception

\*\* Selection by Exception with Collective Referencing



nature of these agreements is discussed in the first section of Appendix A.

The number of records to be stored in the ATRIS master file depends upon the number of acquisitions (e.g., 3,000 per year), the total input budget (e.g., 2,000 records per year), and selection criteria that are discussed in the following section. The third column of Table 4 shows the percentage distribution of the combined HRIS, MRIS, and RRIS files with respect to each type of information. It may be presumed that the corresponding ATRIS distribution will be generally similar to those of the other modal services. However, the individual distributions for HRIS, MRIS, RRIS, and ATRIS will vary from one type of information to another because of modal differences in acquisitions policies and selection criteria.

### 3.3 Selection Criteria

The input scope of an information service is determined not only by the subjects it covers, the types of information acquired, and its information sources, but also by whatever selection criteria are applied to the acquired information. The absence of selection criteria implies that all acquired items will be processed and become part of the ATRIS data base. Since any service is constrained by its input budget and since the acquisition and input of all available information is most likely to cost more than the available funds, it is important to have selection criteria and guidelines. Five general criteria have been identified for selection of ATRIS input information. It is recognized that further development of the selection criteria stated below will depend upon expressed views and desires of the user community.



- a. Age. In general, new input on any subject should be restricted to that which has been generated within the previous five years. Exceptions are for "monumental works" or historically important items from the past. Research project information should not be input unless the project is ongoing or has terminated within the previous year. Project resumes should not be kept on file longer than two or three years after project termination. It is assumed that deleted records will have been published in hard-copy products and will thus be available on an archival basis.
- b. Redundancy. It is not unusual to acquire several different versions of the same substantive information. Examples include draft and final reports, preprints and published papers, and multiple presentations of a paper or report. In general, the ATRIS data base should contain a single "best reference" for all such cases. This best reference may of course change from time to time as better versions of the same paper or report are issued.
- c. Geographical Origin. Surveys have repeatedly shown that users prefer higher selectivity for information produced in other countries than for information produced in their own country. It is somewhat arbitrarily recommended that the selection rate for non-U.S. information should be no higher than one-third of the rate used for comparable U.S. information. The actual selection rate will depend primarily on expressed user needs. English is widely recognized as the international language for aviation; moreover, the more significant documents, reports, etc., are usually available in several languages. Therefore, in very rare and exceptional cases should information be stored about non-U.S. documents that are not available in the English language.

- d. Selection by Exception and Collective Referencing. For some types of information only exceptional items should be selected, particularly if all items of the given type exist in the collection of another information center. Examples include accident investigations, aviation medicine, environmental impact statements, airport master plans, hearing testimony, computer programs, regulations, patents, and numerical data sets. For these and perhaps other types of information, individual items should be selected for input by subject matter specialists and on the basis of their potential to serve the information needs of a majority of users.

Whenever possible, selection by exception should be accompanied by collective referencing in which a single ATRIS reference represents a relatively large collection of primary information. It is assumed that the collection is homogeneous with respect to type (e.g., hearings or accident reports) and that each collective reference represents information that exists at a single source (e.g., at CAB or at NTSB). In conjunction with selection by exception, the collective reference informs users where to find similar information that was not selected by ATRIS. In essence, the collective references constitute a directory to information that has been only lightly covered by ATRIS. Relatively vast sets of numerical data can thus be given collective references. Other applications include collective references to conference proceedings from which ATRIS may have selected only one paper out of twenty. In Table 4, types of primary information that are included under this criterion are marked by asterisks. This criterion also applies to the corresponding secondary information.

- e. Quality. Although judgment of the quality or lasting value of an information item is highly subjective, any acquisition program produces items that are almost sure to be regarded as "garbage" by virtually all users. If selections are made by subject matter specialists, all such items should be discarded or shelved at the selection stage. Other aspects of quality are completeness of information within acquired abstracts or resumes and availability of full-text documents represented by acquired abstracts. Acquired abstracts should not be selected for input unless the bibliographic data are sufficient for identifying and acquiring the corresponding full-text documents.

#### 3.4 Output Scope

The output scope of an abstracting and indexing service is described by the services and products that are made available to the user community. The conventional output of a service such as ATRIS can be listed in three categories as shown in Table 5.

Two output categories, retrieval service and publications, are based directly and entirely upon the contents of the ATRIS data base. The third category covers auxiliary services that enhance utilization of the first two types of output and thereby increase the overall value of the information service.

Retrieval products are responses to individual requests for information on specific topics. Computer retrievals can be made in either the batch mode or in the on-line mode. In the first case, a search strategy that involves combinations of index terms is composed for each of a number of requests, and then the "batch of retrievals is completed in a single computer run. The outputs are then screened for relevance,

Table 5. Output Scope for ATRIS Services and Products

1. RETRIEVAL SERVICES	
1.1 Batch-Mode Retrieval	Performed by ATRIS staff on behalf of individual users. Can include prespecified formats and indexes, and supplemental information not stored in the ATRIS data base.
1.2 On-Line Retrieval	Performed via terminals having telecommunications links to a computer center where the ATRIS data base is stored for on-line access. Can be performed by the individual user or by intermediaries within user organizations or at the ATRIS center.
1.3 Multiple Responses	Distribution of retrieval response for a given query to other users upon request.
2. PUBLICATIONS	
2.1 Announcement Bulletins	Regular issues that display information acquired and stored during the period between issues. Items are grouped within subject areas for browsing purposes. Indexes are generally included with each issue.
2.2 Special Bibliographies	Publications having the same format as announcement bulletins, and that display all information held for some subset of the total subject scope.
2.3 Cumulative Indexes	Author, source and/or subject term indexes to all information stored over a specific period of time.
3. AUXILIARY SERVICES AND PRODUCTS	
3.1 User Aids	Source lists, vocabulary lists, user guides, etc.
3.2 Document Delivery Services	Assistance in meeting user requests for full-text documents.



packaged, and transmitted to the respective users. If subject matter specialists are part of the retrieval sequence, the retrieved material may be supplemented by additional relevant information that is known to the specialist. For users who have infrequent requests and relatively long response time requirements (say, from one to two weeks), one advantage of batch-mode retrieval is that users do not have to plan a search strategy; another is that the retrieval products can be formatted, indexed, or otherwise packaged according to the user's need.

On-line retrieval implies that the data base can be accessed via telecommunications from a terminal that is operated by the user or by an intermediary for the user. The intermediary can be an information specialist at either the information center or within the user's organization. Advantages of on-line retrieval are fast response and the ability to iterate each search strategy until an optimum retrieval has been achieved. With the advent of numerous on-line retrieval systems and on-line data bases, users (and their intermediaries) are turning increasingly to on-line retrieval. The ATRIS data base should therefore be available directly to users through on-line access. In addition, however, the ATRIS service center should provide retrieval products in the batch-mode or on-line mode for users who do not have on-line access or who prefer off-line service for one reason or another.

As shown in Table 5, retrieval products can include multiple responses to specific queries that are posed by one or more users or by the information service staff. The principle of multiple response is analogous to a discussion group situation where one participant asks a question whose answer is useful to many participants. Thus multiple responses serve to disseminate information on topics that are both timely and of general interest.

The second category of proposed output for ATRIS covers three types of publications. The first type is periodic announcement bulletins that contain all abstracts and/or resumes that have been stored during a fixed time interval of no less than one month and no more than six months. The major purpose of an announcement bulletin is to help satisfy user needs for current awareness in one or more subject areas. Although announcement bulletins are generally used in the browsing mode, if they have author and subject term indexes, they can also be used for simple searches. Subscribers to announcement bulletins have, in fact, a complete hard-copy version of the data base. If the service provides cumulative indexes to the bulletins, then the user has a basis for manual retrieval from the entire data base. This type of service is probably most appropriate for users whose greatest needs are for current awareness, whose retrieval requirements are minimal and infrequent, and who strive to acquire the maximum amount of information for a minimum amount of expenditure.

In addition to announcement bulletins and cumulative indexes thereto, service publications can include special bibliographies that cover specified subjects within the total scope of subjects, types, and sources of information. Special bibliographies are generally produced for special purposes or events. For example, if a subject such as noise abatement becomes prominent and timely, a special bibliography can provide current and in-depth awareness of existing information on the subject. In essence a special bibliography is an extension of the multiple response concept described above.

A third category for ATRIS output includes auxiliary services and products that enhance the utilization and effectiveness of retrieval

and publication services. One type of auxiliary service consists of brochures, user guides, vocabulary lists, organization directories, meeting calendars, and other tools that assist users in using the main services or that otherwise increase users' knowledge of the subject field.

A second type of auxiliary service is represented by document delivery services that provide users of retrieval and publication services with easy and reliable access to full-text documents whose references appear in retrieval and publication products. ATRIS users have at least three possibilities for document delivery services: (a) TRISNET Document Delivery Services through, for example, the Northwestern University Transportation Center Library, (b) NTIS for copies of U.S. Government reports, and (c) the Engineering Societies Library for copies of articles that have been referenced by Engineering Index.

### 3.5 Data Element Scope

A final consideration for the scope of an abstracting and indexing service such as ATRIS is the list of data elements of which the stored records are composed (e.g., title, author, source). Data element scope can be a determining factor for the capability of an information service and for user satisfaction with the service. For example, an information service may be of little value to some prospective users if the stored items do not include abstracts of documents or the names of principal investigators for research projects. Two general criteria for inclusion or exclusion of data elements are as follows.

- a. Completeness. Every ATRIS record should be complete with respect to identification data and bibliographic data. If the data cannot be acquired for a needed

element (e.g., publication date), the ATRIS record should so indicate (e.g., no publication date).

- b. Consistency with Bibliographic Practice. Since ATRIS will undoubtedly acquire abstracts and resumes from other information services and may exchange records with some services, data elements for ATRIS records should correlate highly with those used by other abstracting and indexing services. The correlation should be high both with respect to the inclusion or exclusion of a given element and with respect to the documentation rules for the data element.
- c. Utility and Meaning. Every data element that is included in an ATRIS record should have utility and a clear-cut meaning to ATRIS users. The set of elements should be responsive to the information needs of a majority of ATRIS users.

There can be conflicts among these criteria if an exchange agreement should require inclusion of a data element that is not generally useful or even meaningful to ATRIS users. Non-useful data elements can be suppressed on output, but their inclusion on input must be weighed in the light of incremental costs that are associated with the processing and storage of any data element.

Four categories of data elements for ATRIS records are listed in Table 6. Since an ATRIS record may represent either a document or a research project, separate lists are given for each record type. The first category includes all data elements that provide information on the subject content of the document or project. These elements include the title, a brief abstract of the document contents or a brief resume of the project objectives and methodology, one or more subject areas (from Table 1), and



Table 6. Proposed Data Elements for ATRIS Records

Type of Data Element	Data Elements for Records that Represent Full-Text Documents	Data Elements for Records that Represent Research Projects
1. Elements that Describe Subject Content	1.1 Document Title 1.2 Informative Abstract of Document Content 1.3 Subject Area(s) of the Document 1.4 Index Terms for Document Content	1.1 Project Title 1.2 Informative Resume of Project Objectives and Methods 1.3 Subject Area(s) of the Project Work 1.4 Index Terms for Project Scope
2. Elements that Describe Key Organizations and People	2.1 Journal Name or Corporate Author(s) of Reports 2.2 Personal Author(s) of the Document 2.3 Author Affiliation	2.1 Sponsoring Agency and Address 2.2 Performing Agy. & Add. 2.3 Principal Investigator(s)
3. Elements that Provide Additional Data on Documents or Projects	3.1 Type of Document & Language 3.2 Date of Publication 3.3 Document Code Nos. 3.4 Issue Data (e.g., Vol.) 3.5 Pagination Data 3.6 Document Availability 3.7 Document Price	3.1 Project Start and End Dates 3.2 Funding Level 3.3 Contract or Grant Number
4. Elements that Identify the Record	4.1 Record Number 4.2 Record Source 4.3 Storage Date	4.1 Record Number 4.2 Record Source 4.3 Storage Date

index terms that show the specific nature of the document or project.

The second category of data elements provides identification of the organizations and people who are primarily responsible for the existence of the document or project. The third category is for physical data about the document or project, and the fourth category is for elements that identify the record—apart from the document or project it represents.

The elements shown in Table 6 include all elements that are required by the U.S. Department of Transportation's Technical Report Documentation Form DOT F 1700.7 (8-72). The DOT form is shown on page i of this report.

As a final note, it is important that users know which data elements can be used for retrieval purposes. Some retrieval systems can perform searches only on the subject index terms, for example, but most systems can search on any predetermined set of data elements. In the TRB batch-mode retrieval system that is used for HRIS, RRIS, and MRIS, all elements except titles and abstracts or resumes are also retrieval elements. Key words of titles and abstracts or resumes are coded as subject index terms. In more sophisticated retrieval systems, all useful words in the textual part of a record are stored as retrieval terms.

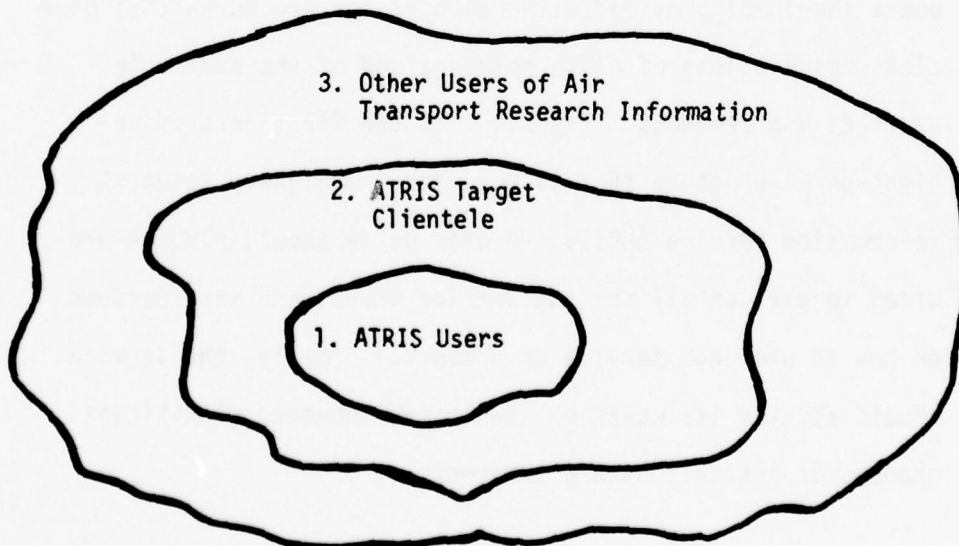
In summary, the data elements of an information record contain the only information about a document or record that is stored; the service output cannot include information that has not been stored in one or more data elements.

#### CHAPTER 4. COMMUNITY INTERACTIONS WITH ATRIS

Interaction between ATRIS and the user community refers either to steps that ATRIS takes to influence the user community or to steps taken by the user community to influence ATRIS. Interactions can occur at a number of levels that range from one-on-one communications between an ATRIS staff member and an individual member of the user community to impersonal notices that ATRIS may distribute to an undefined audience, perhaps through advertisements in trade magazines.

The classification shown in Table 1 (page 15) provides a framework for identifying the user community, but for discussions of interactions it is useful to divide the community into the three categories shown in Figure 2 below. The first category contains the actual users of ATRIS services and products. The second category is a well-identified group of organizations and individuals who are not ATRIS users but who are known to be steady users of air transport research information. This second category is a "target clientele" for ATRIS.

Figure 2. Categories for ATRIS Interactions



The third category includes probable users of air transport research information that are not members of the first or second categories. As a guideline, the target clientele should be at least twice the size of the actual user group. Thus if ATRIS were to have 1,000 actual users, its target clientele might include an additional 2,000 potential users. The nature of ATRIS interactions with each category of users is discussed in the topics that follow.

#### 4.1 Interactions Between ATRIS and ATRIS Users

The major objective for interactions between an information service and the users of its services and products is to improve the match between user needs and wants and the services and products that are offered. To improve this match requires that users know what the service provides and that the service know what users need and want. As improvements are made, the service can expect an increase in the number of users and in the amount of use by each user. Two types of interactions that contribute to the accomplishment of this objective are as follows:

- a. User Awareness and Understanding of ATRIS Input/Output Scope. All users should be provided with pamphlets or brochures that give clear descriptions of ATRIS holdings and of the available services and products. Exhibit 1 is the first part of an eight-panel brochure that is used for the Highway Research Information Service (HRIS). A user guide should also be provided to give detail for the service input, and instructions on how to use each service or product. Finally, the service should apprise its users by newsletter whenever significant changes or innovations are imminent.



Exhibit 1. HRIS Brochure

# Highway Research Information Service

TRANSPORTATION RESEARCH BOARD  
Commission on Sociotechnical Systems  
National Research Council  
National Academy of Sciences

## What Is the Highway Research Information Service?

Developed by the Transportation Research Board with financial support from the state highway and transportation departments and the Federal Highway Administration, it is

### A COMPUTER-BASED INFORMATION STORAGE AND RETRIEVAL SYSTEM

consisting of

#### SUMMARIES OF RESEARCH PROJECTS IN PROGRESS

which are updated periodically and identify performing and sponsoring agencies, principal investigators, funding sources and schedules, and

#### ABSTRACTS OF PUBLISHED WORKS

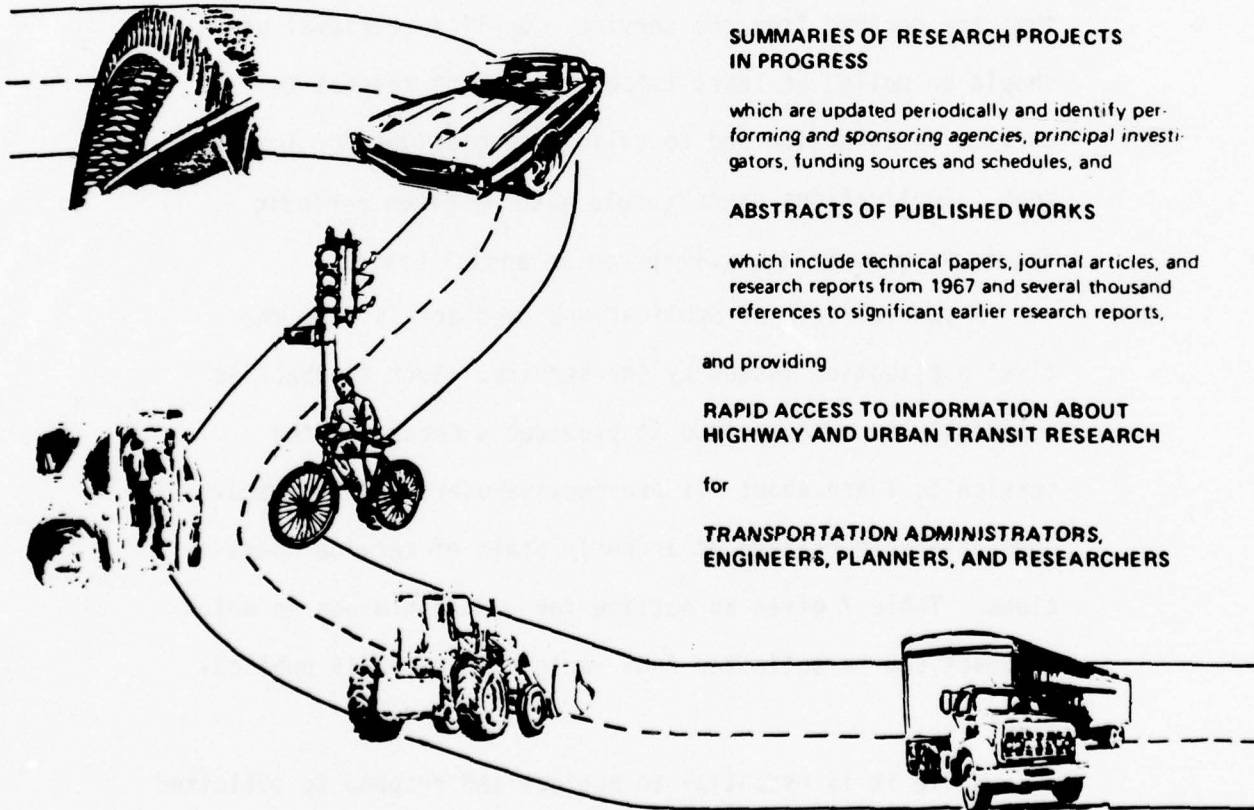
which include technical papers, journal articles, and research reports from 1967 and several thousand references to significant earlier research reports,

and providing

#### RAPID ACCESS TO INFORMATION ABOUT HIGHWAY AND URBAN TRANSIT RESEARCH

for

TRANSPORTATION ADMINISTRATORS,  
ENGINEERS, PLANNERS, AND RESEARCHERS



- b. User Feedback on ATRIS Services and Products. Users can influence the nature of information services and products by providing feedback in the form of letters, phone calls, group discussions, or response to questionnaires. While unsolicited feedback should be welcomed and acknowledged, it is recommended that feedback be solicited from all users on a regular basis. A feedback form can be included with the transmittal of any or all of the service products. An example of an HRIS retrieval feedback form is shown in Exhibit 2. This form provides HRIS with data on how respondents use the retrieval products and on the benefits that are derived from the service. On-line retrieval users should be polled at least twice a year with respect to service satisfaction and to solicit suggestions for improvement. Publications users should also be given periodic feedback opportunity, perhaps on an annual basis.

A special case of publications feedback is from the first publication issued by the service. Such feedback is especially important since it provides a means for the service to learn about its prospective users and to introduce desirable changes at an early state of service operations. Table 7 gives an outline for question areas in which feedback can be solicited from recipients of ATRIS publications.

While it is essential to analyze and respond to solicited user feedback, it is generally the case that only a minority of users take the time to fill out and return feedback forms.

## Exhibit 2. HRIS Retrieval Feedback Form

### USER EVALUATION OF A HIGHWAY RESEARCH INFORMATION SERVICE RESPONSE (to be completed by the original requester)

User comments and evaluation of our response to your request for information about

can help us improve the HRIS. We would appreciate an answer from the principal user of this information to a few questions about this file search response. Please complete this user evaluation sheet and return it to:

HIGHWAY RESEARCH INFORMATION SERVICE  
TRANSPORTATION RESEARCH BOARD  
NATIONAL ACADEMY OF SCIENCES  
2101 CONSTITUTION AVENUE, N.W.  
WASHINGTON, D.C. 20418

Very truly yours,

*A.B. Mobley*  
A. B. Mobley  
Manager of HRIS

Your Name _____	Today's Date _____
Title _____	Date Request Sent to HRIS _____
Organization _____	Date Response Received from HRIS _____
Address _____	
City, State, Zip _____	Telephone Number _____

1. OVERALL QUALITY OF THIS RESPONSE

☐ EXTREMELY VALUABLE ☐ VALUABLE ☐ NO VALUE ☐ CAUSED PROBLEMS

COMMENTS: \_\_\_\_\_

2. WAS THE RESPONSE BENEFICIAL IN SAVING TIME? ☐ YES ☐ NO ☐ IN SAVING MONEY? ☐ YES ☐ NO ☐
3. WAS THIS YOUR FIRST REQUEST FOR AN HRIS FILE SEARCH? ☐ YES ☐ NO ☐
4. IF WE RETRIEVED NO DOCUMENT RECORDS IN THE SEARCH INITIATED BY YOUR QUERY, WAS THIS NEGATIVE INFORMATION BENEFICIAL? ☐ YES ☐ NO ☐
5. IF OUR RESPONSE TO YOUR QUERY PRODUCED NO DOCUMENT RECORDS OF WHICH YOU WERE NOT ALREADY AWARE, WAS THAT KNOWLEDGE BENEFICIAL TO YOU? ☐ YES ☐ NO ☐
6. DO YOU HAVE KNOWLEDGE OF ONGOING OR COMPLETED RESEARCH PROJECTS THAT CLEARLY RELATE TO YOUR QUERY BUT DID NOT TURN UP IN OUR RESPONSE? IF SO, PLEASE TELL US WHAT THEY ARE. \_\_\_\_\_

7. PLEASE LIST OTHER SOURCES OF HIGHWAY TRANSPORTATION RESEARCH INFORMATION THAT WERE USEFUL TO YOU FOR THIS REQUEST \_\_\_\_\_

8. AS A RESULT OF THE RESPONSE, DID YOU:

- |   |   |
|---|---|
| A. CONTACT A RESEARCH PROJECT INVESTIGATOR OR AUTHOR OF A REPORT?   | <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> |
| B. ORDER A FULL-TEXT DOCUMENT?                                      | <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> |
| C. BECOME CONSCIOUS OF A NEW IDEA OR INSIGHT TO ADVANCE YOUR WORK?  | <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> |
| D. CONTINUE YOUR WORK, SATISFIED WITH YOUR KNOWLEDGE OF THE SEARCH? | <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> |
| E. ABANDON THE STUDY OR PROJECT?                                    | <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> |

9. OTHER COMMENTS: \_\_\_\_\_

Table 7. Outline of Question Areas for User Feedback on ATRIS Publications

1. Identification of User Organizations
  - 1.1 Type of Organization
  - 1.2 Major Work or Mission
  - 1.3 Role in the air transportation field
2. Identification of Individual Users Within Organizations
  - 2.1 Type of Work and Number of People for which there are air transport information needs
  - 2.2 Key contact(s) for communications with ATRIS
3. Information Needs of Organizations & Users Within Organization
  - 3.1 Distributions of Current Awareness Needs vs. Needs for Specific Information (In terms of Frequency of Need)
  - 3.2 Relative Needs for Information of Different Types (Frequency of Need)
  - 3.3 Relative Needs for Information in Different Subject Areas (Frequency of Need)
  - 3.4 Relative Needs for Information from Different Sources (Frequency of Need)
4. Information Practices and Resources Used to Satisfy Needs
  - 4.1 Use of Libraries (Frequency of Use)
  - 4.2 Use of Other Intermediaries (Frequency of Use)
  - 4.3 Use of Primary Publications (Types and Frequency of Use)
  - 4.4 Knowledge and Use of Secondary Information Resources (Specific Resources and Frequency of Use)
5. Level of Satisfaction Now Attained (High, Medium or Low Levels)
  - 5.1 For items in Question Area 3
  - 5.2 Through Practices in Question Area 4
6. Level of Satisfaction with ATRIS Publication(s) (High, Medium, or Low)
  - 6.1 For items in Question Area 3
  - 6.2 For individual features of the publication(s)
7. Overall Value of ATRIS Publication(s)
  - 7.1 Relative Benefits for Items in Question Area 3 (High, Medium, or Low)
  - 7.2 Value Relative to Publication Charge (High, Equal, Lower)
8. Wants for Improvements & Innovations
  - 8.1 Improvements in individual features of Question Area 6.2
  - 8.2 New or Different Types of ATRIS Publications



Follow-up calls and letters may be necessary to insure that all types of users are properly represented in conclusions that are drawn. An information service should budget and conduct user conferences from time to time, perhaps on a two or three year cycle. A representative sample of perhaps twenty users from the various categories of Table 1 should be invited to spend at least one day in the discussion of service deficiencies and service improvements that are wanted by the users.

During the formative years of an information service it is wise to have a continuing conference of users and potential users in the form of an advisory or overview committee. The present ATRIS Committee is an example of this form of interaction between the prospective service and the potential user community.

In Chapter 2 (page 22) it was estimated that less than half the users of an information service such as ATRIS are end users and that the majority of users are intermediaries for end users (e.g., librarians). To be representative of the user community, conferences and committees should therefore include both types of users.

#### 4.2 Interaction Between ATRIS and the Target Clientele

The target clientele for ATRIS would consist of specific organizations that are identified within the framework of Table 1. A mailing list should be developed and maintained for all these organizations; for each organization, one or more individuals should be identified as key people for interactions between ATRIS and the target organizations.

It is assumed that the list will be a mixture of organizations that currently use ATRIS services, organizations that may have used ATRIS services at one time or another, and organizations that have never used ATRIS services. Interactions with ATRIS users have been discussed in the preceding section; interactions with the remaining organizations should include dissemination of ATRIS brochures, newsletters, and samples of ATRIS products and should also include telephone or personal interviews with representative members of the target clientele. The interviews should reveal why the interviewees are not ATRIS users, and perhaps more important, what ATRIS services and products would have to be like to make the interviewee an ATRIS user. It is often the case that interviews can provide more useful information than other marketing methods such as mail questionnaires.

It should be an ATRIS goal to convert steadily increasing numbers of the target clientele into ATRIS user organizations; it is especially important that ATRIS users include organizations that are leaders in the air transport field since these organizations have important requirements for air transport information.

#### 4.3 Interactions between ATRIS and the General Community

There are at least two mechanisms whereby ATRIS can increase the level of knowledge and interest for its services and products throughout the general user community. One is through feature articles and advertisements in trade magazines and professional journals; the other is through exhibits and other types of presentations at conferences that are attended, at least in part, by users of air transport research information.

Feature articles should be prepared and submitted for publication whenever significant milestones are reached in the service history;

advertisements are warranted whenever new products or services are available.

Participation in conferences provides ATRIS visibility and useful personal interactions between staff and potential users. One technique that has been used by RRIS is to produce special bibliographies on conference themes or subthemes. These special products not only enhance the conference itself, but also provide a conversation piece for discussions with potential users.

#### 4.4 Check List for Effectiveness of ATRIS Interactions

The effectiveness of interactions between ATRIS and the user community is closely related to the evaluation of ATRIS itself. The ATRIS Committee believes that, at any point in its development and operation, ATRIS should have objective answers to the following questions and that the answers should provide the essential basis for evaluation of ATRIS.

- a. How well has the target clientele been identified, in terms of both organizations and key contacts within organizations? How well is the target clientele informed of ATRIS services and products?
- b. How does the target clientele meet its current information needs? Which of these needs can ATRIS meet?
- c. How many organizations have been given the opportunity to learn about ATRIS through presentations and demonstrations at air transport related conferences? Through magazine articles and advertisements? Through direct mailing?
- d. To what degree has the target clientele subscribed to ATRIS publications? Are the key organizations in each

- sector of the community represented? What is the average number of individual users per subscription?
- e. Which elements of the user community are regular users of ATRIS retrieval services? What is the distribution for batch-mode and on-line services? What trends are in evidence for the mix of retrieval and publication usage?
  - f. What is the level of user satisfaction with the scope, format, and timeliness of ATRIS publications and retrieval services? What changes are scheduled for improvements that users want?
  - g. How are ATRIS services and products used by individual users? For what purposes? What benefits are realized? How do users feel about the level of current user charges relative to benefits received?
  - h. What are overall information needs and practices of ATRIS users? What part of these needs does ATRIS serve? Which practices are supplemented or enhanced by ATRIS services and products?
  - i. What would ATRIS have to be like before non-users of ATRIS would become ATRIS users?
  - j. How much of the evidence for answers to the previous questions is represented by unsolicited feedback? How much by solicited feedback? How much by user conferences? How valid and reliable is ATRIS's knowledge of the information needs, wants, and practices of its target clientele?
  - k. What innovations and changes are planned for ATRIS services and products over the ensuing three years?



## CHAPTER 5. COST ESTIMATES AND FUNDING ALTERNATIVES FOR ATRIS ACTIVITIES

The purpose of this chapter is to provide a financial framework for the action plan that will be presented in Chapter 6. Estimates are given for the costs of ATRIS development and operation, and alternatives are discussed for deriving funds that meet the cost requirements.

### 5.1 Cost Estimates

Costs of ATRIS development and operations are presented in five categories: development costs, input operation costs, output operation costs, costs of community interactions, and overhead costs. Relative costs in the first four categories are largely determined by the size of the user community (See Chapter 2), the input and output scope of the service (See Chapter 3), and the extent of user interactions (See Chapter 4). Absolute costs in all five categories depend upon how and where ATRIS is institutionalized, e.g., as a federal activity, as a not-for-profit activity in the private sector, or as a commercial enterprise. The estimates to be presented are based on the corresponding costs of HRIS, MRIS, and RRIS, which are housed in the Transportation Research Board of the National Research Council. It is recognized that a survey of similar services among other organizations would reveal a range of actual or estimated costs in each category.

- a. Development Costs. Development of an information service such as ATRIS includes planning and design, formalization of acquisition agreements, development of

procedures, tools, and software for input and output operations, initial interactions with the user community, and the creation of a staff organization to carry out the service activities. If ATRIS development must start from "scratch," it is estimated that two to three years will be required and that development costs will be in the neighborhood of \$200,000 per year. If, however, ATRIS can be developed as an extension of an existing service, then both the development time and costs can be reduced by at least fifty percent. For example, the development of RRIS required approximately one year and \$100,000 because staff organization, input-output procedures, and system software had already been developed by HRIS and MRIS. Development costs will of course decrease rapidly after the first year or two of implementation, but some development is required for virtually any year of operation.

- b. Input Costs. A detailed discussion of input operations and associated costs is given in Appendix A. Major categories of input costs are acquisition, abstracting, indexing, coding, keyboarding, and storage. Acquisitions can be secondary information in the form of machine-readable records, secondary information in the form of hard-copy records, or primary information in the form of full-text documents. It is estimated that the respective unit costs of input operations for these three types of acquisitions are \$10, \$13, and \$18, exclusive of overhead costs. If ATRIS experience is similar to that of the

other modal information services, about fifty percent of the acquisitions will be in machine-readable form, about thirty percent will be hard-copy abstracts or resumes, and about twenty percent will be full-text documents. Based on this input distribution and the estimated unit costs, the average cost of input processing would be about \$12.50 per record stored.

- c. Output Costs. The three major types of ATRIS output proposed in Chapter 3 were publications such as regular abstract bulletins or special bibliographies, batch-mode retrieval, and on-line retrieval. Details for output operations are presented in Appendix B.

Costs of ATRIS publications depend upon the number of issues, the number of pages in each issue, and the number of copies that are distributed. If ATRIS publications are similar to those of HRIS, MRIS, and RRIS, it is estimated that each issue will cost about \$5 per page plus about \$3 per copy, exclusive of overhead. Thus the output costs for 500 copies of a 200 page bibliography would be about \$2,500. The estimated annual cost of a quarterly abstract bulletin that contained 400 pages per issue and that was distributed to 1,000 subscribers would be about \$20,000, again exclusive of overhead costs.

Batch-mode retrieval costs depend upon the number of requests processed within a given batch, the complexity of the search strategy, and the number of items retrieved and

printed out. If retrieval runs include about twenty requests and if each request produces an average of about 100 printouts, then the estimated average output cost per request is \$50 before overhead.

On-line retrieval involves two types of costs: update and storage costs that make the data base available at any time to any user, and retrieval costs that are incurred when an individual request is processed. Rough estimates for storage costs are one dollar per record for initial entry and fifty cents per year per record to provide on-line access. Thus storage costs increase as the data base becomes larger. If ATRIS were to begin on-line storage with a data base of 5,000 records and if 3,000 records were added in the first year, the total storage cost for the first year would be about \$12,000 (\$8,000 for entry and \$4,000 for access). If the data base grows at this rate for five years, the fifth year cost would be about \$13,000 (\$3,000 for entry of 3,000 records and \$10,000 for access to 20,000 records).

On-line costs for an individual request depend upon connect-time rates, telecommunications rates, length of time spent in on-line searching, and amount of off-line printout requested. A general estimate of connect-time plus telecommunication costs is one dollar per minute, excluding operator costs and terminal equipment costs. Off-line print charges are of the order of ten cents per record. Thus if an operator spends twenty minutes for a given retrieval and



requests off-line print of one hundred records, the retrieval cost will be about \$30. Relative advantages of batch-mode and on-line retrieval are discussed in Appendix

B. Since it is quite likely that on-line access to the ATRIS data base will be provided by an organization (vendor) other than ATRIS, it may be assumed that on-line retrieval costs will be paid directly to the vendor by individual on-line users, and that ATRIS will receive a portion of these charges (perhaps fifteen to twenty percent) for having supplied the records to the vendor.

- d. Costs of Community Interactions. Costs of interactions between ATRIS and the user community include printing and distribution of publicity items, feedback items, communications and travel, and holding committee meetings and user conferences. The cost of any particular type of interaction clearly depends upon the frequency of occurrence and the number of users that are involved. It can be expected that ATRIS costs in this category will be at least \$5,000 (excluding overhead) in any given year and that the long term annual average will be about ten percent of the annual operating budget.
- e. Overhead Costs and Total Costs. Cost estimates that have been given for the first four categories (a-d) do not include overhead costs for management and administrative functions nor institutional requirements for housing and other facilities. It is assumed that overhead costs are proportional to total costs for the first four categories, but that a minimum overhead is required to provide adequate direction and management. More specifically, it is estimated that the

total overhead will be at least equal to the total costs in the first four categories and that a minimum overhead is \$40,000 per year. For example, if annual development costs were \$10,000, input costs were \$50,000, output costs were \$30,000, and community interactions costs were \$10,000, then the subtotal for these costs would be \$100,000. The minimum overhead estimate is therefore \$100,000 and the minimum total annual cost would be \$200,000. The numbers used in this example are generally similar to the annual operating budgets of RRIS and MRIS after five years of development and operation. Personnel requirements at this level of effort are estimated to be about six man-years per year, including about three full-time personnel and a number of part-time personnel for special functions such as abstracting, programming, keyboarding, and filing.

## 5.2 Funding Sources and Strategies

Three major sources of financial support will be considered for meeting the costs of ATRIS development and operations: major sponsors, institutional supporters, and all other users of ATRIS services and products. The level of ATRIS operations, i.e., total annual costs, is limited by the total income received from these three sources.

A major sponsor is any organization that provides funds for at least ten percent (say) of the total annual costs. Major sponsors of HRIS, for example, are the state departments of transportation and the Federal Highway Administration, U.S. DOT; the major sponsor of RRIS is the Federal Railroad Administration, U.S. DOT; and the major sponsor of MRIS is the Maritime Administration, U.S. Department of Commerce. It can be assumed that major

sponsors of ATRIS would include one or more federal agencies that have responsibility for the dissemination and utilization of air transport information that has been generated through the sponsors' programs. A primary example is the Federal Aviation Administration, U.S. DOT. Other possibilities are the Civil Aeronautics Board and the National Transportation Safety Board.

The agreement(s) between an information service and its major sponsor(s) can be expected to provide a stated quantity of services and products for the sponsor's use, but it may be assumed that the funds provided by a major sponsor are tens if not hundreds of times the output costs of the services and products received.

Institutional supporters are organizations that are generally, but not necessarily, outside the federal government and for whom the service provides indirect benefits that are considerably greater than the market price of services and products that the supporters receive from ATRIS. Indirect benefits to major sponsors and to institutional supporters are largely intangible, but include good will and appreciation from their respective constituencies for creating and sustaining a needed and useful information service that would not otherwise exist.

One distinction between a major sponsor and an institutional supporter is the order of magnitude of support. If a major sponsor provides funds of the order of hundreds of thousands of dollars per year, for example, an institutional supporter may provide funds of the order of thousands or tens of thousands of dollars per year. For modal information services, the most likely institutional supporters would be associations of industries whose livelihoods are specific to the respective modes.

supporters, but there are indications that such support would be provided if sponsor support and user charges are not sufficient to maintain a useful service.

The third source of financial support is from user charges to all individuals and organizations that are not major sponsors or institutional supporters. Through brochures and other public information, the information service announces a user charge for each product or type of service and users are billed accordingly. At the present time, user charges cover about twenty percent of the HRIS, RRIS, and MRIS annual operating costs.

A funding strategy is essentially a plan for meeting the total costs of a given level of effort from a specific mixture of income from major sponsors, institutional supporters, and user charges. Since all four of these factors are variable and interdependent, differences between planned and actual dollar levels of one factor must be compensated for by changes in the dollar level of one or more of the other factors. Guidelines for initial ATRIS strategies and for subsequent adjustments are presented below in the form of questions and answers.

- a. *Who might be the major sponsors of ATRIS and what levels of annual support can be expected for each?*

The most likely major sponsor for ATRIS is the Federal Aviation Administration. This support should represent all FAA units whose interests and constituencies are likely to benefit from ATRIS. Based on the experience of other modal information services, FAA support might range between \$100,000 and \$200,000 per year.



- b. *Who might be institutional supporters of ATRIS and what level of support can be expected?*

The most likely institutional supporters are non-DOT federal agencies having air transport interests, as exemplified by the Civil Aeronautics Board, and air transport industry associations, as exemplified by the Air Transport Association. Support from a particular institution might range from \$2,000 to \$5,000 per year. Total income from institutional supporters might grow from \$10,000 to \$50,000 per year.

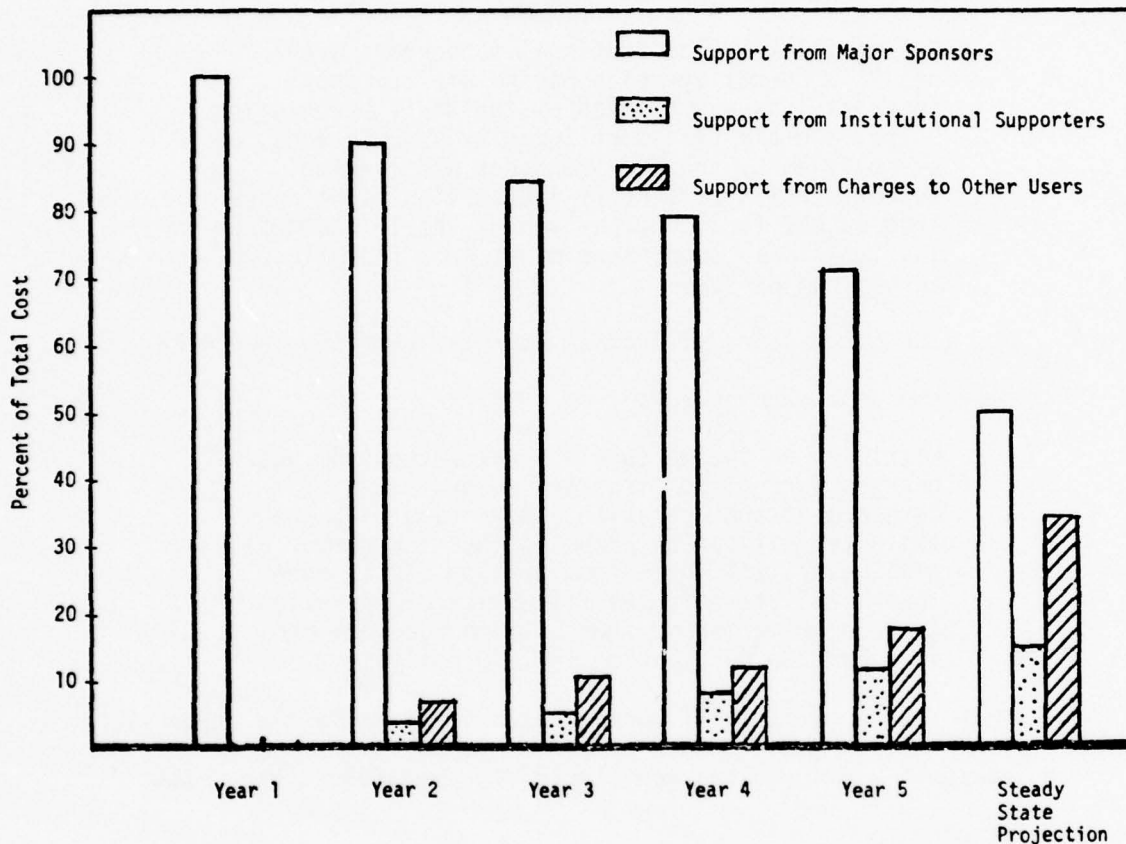
- c. *How many other users will ATRIS have and what income can be expected from user charges?*

Little or no income should be expected from user charges during the first and second years of development and operation. Beginning with the third year it can be expected that the number of ATRIS users will grow from perhaps 300 to more than 1,000 users in the fifth year of operation. Corresponding income from user charges may grow from \$25,000 per year to \$80,000 per year.

- d. *What fractions of total costs should be borne by the three respective sources and how should the fractions change with time?*

An illustrative answer to this question is shown in Figure 3 for a five year period that begins with initial development. In this illustration the major sponsors pay all costs in the initial year and lower their percentage support each year until a projected steady state is reached in which the major sponsors pay half of all costs. Institutional support begins at five percent in year 2 and reaches a projected steady state of fifteen percent. Income from charges to all other users is shown to be at five percent in the second year and to reach a steady state level of thirty-five percent of the annual operating costs.

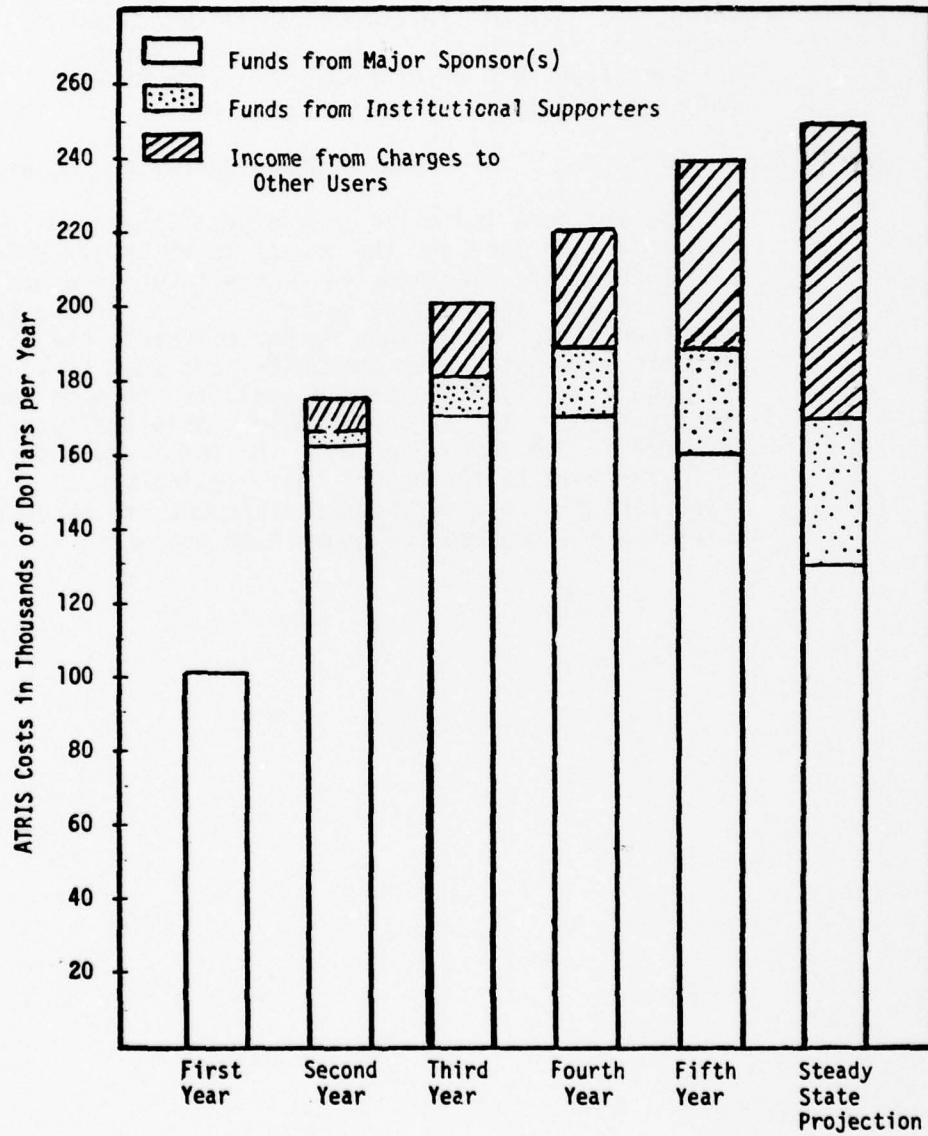
Figure 3. Illustrative Allocation of ATRIS Financial Support



e. What dollar levels should be allocated to the respective sources of ATRIS support?

This question is related to all the preceding questions and must be answered in terms of assumptions for the levels at which ATRIS activities are performed. Figure 4 shows an illustrative allocation of dollar levels that is based on the percentage allocations shown in Figure 3 and the assumptions that ATRIS activities begin at a level of \$100,000 per year and reach a steady state level of around \$250,000 per year.

Figure 4. Illustrative Dollar Allocations of ATRIS Costs



- f. *What strategy should be used if income is less or more than the planned and budgeted level?*

The budgeted level of ATRIS operations should be based on assured income through contracts and subscriptions. Input operations can be decreased to compensate for shortfalls in estimated income. All operations can be expanded if income exceeds budget expectations.

- g. *How can the cost-effectiveness of ATRIS operations be evaluated?*

Perhaps the best indications of effectiveness for an information service are the extent to which its services and products are used and the degree to which users are satisfied with the service output. Extent of use can be measured by the absolute number of users, the distribution of users within the user community, and year to year trends in usage. Satisfaction can be evaluated through user feedback and by the degree to which individual users maintain or increase their level of use. An information service is cost effective to the degree that its individual financial supporters find the services and products to be cost effective and thereby continue their support.



## CHAPTER 6. ACTION PLAN FOR ATRIS IMPLEMENTATION

In this chapter an action plan is presented for ATRIS implementation during the three successive years that follow the present year of planning and prototype production. The present year will be labeled Year 0; subsequent years will be Year 1, Year 2, and Year 3.

The action plan sets out development and operations tasks in three categories: input operations, community interactions, and output operations. Cost estimates that were presented in Chapter 5 provide a basis for estimated annual costs in successive years of the action plan. Estimated annual income is based on funding strategies that were discussed in Chapter 5. The action plan is summarized in Table 8.

### 6.1 Input Operations

The first major task for ATRIS input operations is to specify input procedures and to develop tools and software that are needed to carry out the input processing steps. Initial specifications for input procedures have been given in Chapter 2 and Appendix A of this report. All essential software is now available as a result of HRIS, RRIS, and MRIS development. A tentative classification scheme is contained in Chapter 2; by the end of Year 1 the ATRIS classification and indexing vocabulary should be a relative stable tool for use in successive years. It is expected that user interactions will reveal a need for adjustment and perhaps extension of input procedures in Year 2 and again in Year 3.

It is most important that acquisition agreements be developed between ATRIS and major sources of information that collectively cover the ATRIS scope. In Year 0 prototype arrangements have been made for acquisitions from NTIS, Ei, and NASA. In Year 1 a full set of agreements

Table 8. Action Plan for ATRIS Implementation

ACTION PLAN ITEMS	YEAR 0 (FY1977) TASKS AND ACCOMPLISHMENTS	YEAR 1 (FY1978) TASKS AND ACCOMPLISHMENTS	YEAR 2 (FY1979) TASKS AND ACCOMPLISHMENTS	YEAR 3 (FY1980) TASKS AND ACCOMPLISHMENTS
1. INPUT OPERATIONS	• Implementation Plan	• Classification & Indexing Vocabulary	• Adjustment of Input Procedures	• Adjustment of Input Procedures
1.1 Input Procedures	• Classification Scheme			
1.2 Acquisition Agreements	• Prototype Implementation	• Full Implementation	• Full Implementation	• Full Implementation
1.3 Input Processing	• Storage of 1,000 records • Data Base of 1,000 records	• Storage of 2,000 records • Data Base of 3,000 records	• Storage of 3,000 records • Data Base of 6,000 records	• Storage of 3,000 records • Data Base of 9,000 records
2. COMMUNITY INTERACTIONS	• Implementation Plan			
2.1 Communications with Target Clientele	• Preliminary Identification • Distribution of Prototype Bibliography	• Second Phase Identification • Distribution of ATRIS Publicity • Selective In-Depth Interviews	• Identification Update • Distribution of ATRIS Publicity	• Identification Update • Distribution of ATRIS Publicity
2.2 Communications with ATRIS Users		• Prototype Bibliography Feedback	• Publications & Retrieval Feedback • User Conference	• Publications & Retrieval Feedback • User Conference
2.3 Other Interactions with the Air Transport Community	• ATRIS Committee Meetings	• Advertisements & Presentations • ATRIS Steering Committee	• Advertisements & Presentations • ATRIS Steering Committee	• Advertisements & Presentations • ATRIS Steering Committee
3. OUTPUT OPERATIONS	• Implementation Plan		• Adjustment of Output Procedures	• Adjustment of Output Procedures
3.1 ATRIS Publications	• Prototype Bibliography	• ATRIS Abstracts Prototype	• ATRIS Abstracts Nos. 1 & 2	• ATRIS Abstracts Nos. 3 & 4 • Special Bibliography
3.2 Retrieval Services			• Batch-mode retrievals • On-Line storage & update of ATRIS data base	• Batch-mode retrievals • On-Line storage & update of ATRIS data base
3.3 Auxiliary Services & Products		• Assessment of User Needs & Wants	• User Guide to include ATRIS Sources & ATRIS Vocabulary	• Reassessment of User Needs & Wants • Cumulative Index (Year End)
4. TOTAL LEVEL OF EFFORT (Estimated Annual Cost)	\$100,000	\$100,000	\$175,000	\$200,000
5. FUNDING PLAN				
5.1 Major Sponsors	\$100,000	\$100,000	\$160,000	\$170,000
5.2 Institutional Supporters			\$5,000	\$10,000
5.3 User Charges			\$10,000 Total	\$20,000 Total
a. Subscriptions			\$8,000	\$16,000
b. Batch-mode retrieval			\$1,200	\$2,400
c. On-Line retrieval			\$800	\$1,600

should be developed between ATRIS and all primary sources in both the United States and other countries. During Year 2 and Year 3 these agreements should be maintained, modified, and extended as needs become apparent.

The third input task is to process and store ATRIS records on a regular basis and thereby to build up the ATRIS data base. In Year 0 approximately 1,000 records have been stored, mainly within the Airport subject area. In Year 1 it is proposed that 2,000 records be stored in all subject areas, but mainly limited to acquisitions received in machine-readable form. Thus the ATRIS data base would contain about 3,000 records at the end of Year 1. In Year 2 and Year 3 the action plan calls for full coverage of the ATRIS scope at the rate of 3,000 new records per year. Thus the ATRIS data base would contain 6,000 records at the end of Year 2 and 9,000 records at the end of Year 3.

## 6.2 Community Interactions

In Year 0 virtually all interactions with the user community have been through ATRIS Committee representation of the community. In addition, however, a preliminary target clientele has been developed as shown in Appendix C of this report. At the end of Year 0 or possibly at the beginning of Year 1, a prototype bibliography with feedback form will be distributed to the initial target clientele. The first-year bibliography covers information about airports since airports are of interest and concern to a wide range of potential users.

Identification of a firm target clientele should be accomplished during Year 1 and updated in each successive year. In Year 1 an ATRIS brochure should be developed and distributed to the target clientele. This distribution should be repeated in Year 2 and Year 3 and

should include the solicitation of ATRIS subscriptions. The target clientele should be informed of new services and products through newsletters and illustrative materials. In Year 1 it is proposed that a series of one-on-one in-depth interviews be held with selected members of the target clientele.

Interactions with ATRIS users should include feedback on ATRIS publications in each year of the action plan and feedback on ATRIS retrieval services in Year 2 and Year 3. Two types of feedback are proposed: (a) written responses to questions or check lists sent to users and (b) modest annual conferences of users that represent all major types of users. Experience with HRIS user conferences has shown that these conferences are quite effective for determining adjustments that are needed in the input and output operations.

At least once per year ATRIS should interact with the general user community through magazine articles, magazine advertisements, and presentations or exhibits at conferences in the air transport field.

Finally, the action plan provides for a small ATRIS Steering Committee that would represent major elements of the user community and would meet twice yearly to assess ATRIS operations and user acceptance.

### 6.3 Output Operations

The only ATRIS output in Year 0 is the year-end prototype special bibliography. At the end of Year 1 the action plan calls for a prototype issue of a regular ATRIS abstracts bulletin that would cover all subject areas. Beginning in Year 2 the plan calls for semiannual publication of the abstracts bulletin on a regular basis. Thus subscriptions would be solicited for the publication at the end of Year 1.



Beginning in Year 2, batch-mode retrieval services would be offered upon request; the ATRIS data base would be stored for on-line access and updated on a monthly basis.

A year-end report in Year 1 would be an assessment of user needs and wants, based on user feedback from the Year 0 bibliography and from the in-depth interviews that are held in Year 1. A second assessment would be reported in Year 3. It is expected that adjustments in ATRIS input and output operations will result from these assessments.

Another special product would be an ATRIS user guide (Year 2) that would explain ATRIS services and products. The guide would list ATRIS information sources and the ATRIS classification and indexing vocabulary.

In Year 3 it is proposed that a second special bibliography be prepared to cover issues and subjects that are of high interest at that period of time. At the end of Year 3, the plan calls for a cumulative index to the complete contents of the ATRIS data base, estimated to be 9,000 records. The index would serve both as a retrieval tool for on-line users and as an inducement for publications subscriptions.

#### 6.4 Estimated Annual Costs

For the levels of effort that have been described in the preceding sections, the estimated annual costs are \$100,000 in each of Year 0 and Year 1, \$175,000 in Year 2, and \$200,000 in Year 3.

It is expected that actual implementation costs will vary from these rounded estimates as detailed work statements and corresponding budgets are prepared for each of the successive years.

### 6.5 Funding Plan

The breakdown of planned or estimated income for support of ATRIS costs is given in the bottom part of Table 8.

In Year 0 the total cost of planning and prototype activities was funded by a single sponsor, the Federal Aviation Administration, at a level of \$100,000. It is assumed that the same funding plan will be used in Year 1 and that during Year 1 agreements will be developed for institutional support in Year 2 and for user subscriptions to Year 2 publications.

The funding plan for Year 2 is to derive \$160,000 from FAA support, \$5,000 from institutional supporters, and \$10,000 from other ATRIS users. It is assumed that each institutional supporter will provide from \$1,000 to \$2,000 annual support. Income from user charges is projected to be about eighty percent from publications subscriptions and about twenty percent from retrieval charges.

For Year 3, the funding plan is for the major sponsor to provide \$170,000, or eighty-five percent of the total estimated costs. Institutional support would be \$10,000 and user charges would produce \$20,000. The increase in user charge income would occur partly through increased subscriptions to ATRIS publications, but mainly from increased use of on-line retrieval.

The experiences of HRIS, MRIS, and RRIS during their respective developmental years can be used to estimate ATRIS income from user charges. If the annual subscription to the abstract bulletin is priced at \$40, then 200 subscribers are needed to meet the Year 2 funding plan for income from publications (\$8,000) and 400 subscribers are needed for Year 3 (\$16,000). It is reasonable to suppose that ATRIS will derive an average of \$60 from batch-mode retrievals, that at least 20 requests will be processed in Year 2, and that at least 40 requests will be processed in Year 3. Income from batch-mode retrievals would thus be \$1,200 and \$2,400 in these two years—leaving \$800 and \$1,600 to be derived from on-line retrieval charges. It can be expected

that ATRIS will receive around \$10 for each hour that on-line users are connected to the ATRIS data base. Thus this example supposes that on-line use would be 80 hours in Year 2 and 160 hours in Year 3.

It is almost certain that the action plan for ATRIS will need annual revision as financial commitments from sponsors and institutional supporters become more definite and as income from user charges can be more closely estimated. Primary concerns for any revision, however, are that ATRIS operates at an annual level that is adequate for meeting user needs and wants and that there be an equitable distribution of ATRIS costs among sponsors, institutional supporters, and all other users.

## APPENDIX A . ATRIS INPUT OPERATIONS

Input operations for an information service can be discussed in two general categories: procedures for acquiring material that covers the information scope of the service, and procedures for processing and storing the acquired information.

### 1. Acquisition and Exchange Agreements

For the most part an information service acquires information through acquisition agreements with other organizations. It may be of course that the service receives unsolicited information or that friends of the service identify and transmit potential input on an intermittent basis, but systematic coverage of the service scope requires agreements that insure a predictable and balanced flow of input information.

Highest priority should be given to agreements that provide ATRIS with machine-readable abstracts and resumes. Second priority should be given to agreements for hard-copy abstracts and resumes that cannot be acquired in machine-readable form and that cover significant parts of ATRIS scope that is not covered by machine-readable acquisitions. The remainder of the ATRIS scope must be covered by agreements for the acquisition of important full-text documents that are not represented by either of the first two types of acquisitions. Based on the experiences of similar information services, it may be possible to attain an ATRIS input mix of something like fifty percent-thirty percent-twenty percent for the three respective types of acquisitions.

Agreements between ATRIS and other organizations can be supply agreements through which ATRIS receives information within a specific scope and at specified intervals. These agreements can be for outright purchase of the supplied information or may be licenses for ATRIS to use the material under specified conditions and/or with specified dollar returns to the supplier.



If ATRIS has a single major sponsor, say, the Federal Aviation Administration, it may be more appropriate for the sponsor to enter into interagency agreements with federal sponsors of other information services that are potential suppliers to ATRIS. An important example of this case would be an interagency agreement between FAA and NASA for supply to ATRIS of specified types of abstracts that are not acquired through other ATRIS agreements or that are more economically acquired through the interagency agreement.

During the formative years of TRISNET there has been a U.S. DOT agreement with NTIS through which machine-readable abstracts of transportation reports have been made available for use in the TRIS-On-Line data base and by the modal abstracting and indexing services such as HRIS. If TRISNET development continues it may be assumed that the NTIS agreement with DOT will continue to serve as an ATRIS supply agreement.

A second class of agreements is for information exchange on a quid pro quo basis. Through these agreements ATRIS would receive specified types and forms of secondary information or primary information on a regular basis and in return would transmit specified portions of its own data base in machine-readable or hard copy form.

It may be assumed that international agreements are quid pro quo, partly to avoid financial transactions, but mainly because there is a natural basis for exchange, namely, to exchange information generated in the U.S. for information generated in one or more other countries.

The agreements shown in Table 9 represent a potential basis for ATRIS acquisitions. Three of the agreements listed represent simple extensions of agreements that are now in effect for HRIS, RRIS, and MRIS; these are the agreements with NTIS, Ei, and SSIE. The remaining agreements are specific to air transport information and are therefore unique to ATRIS.

Table 9. Potential Agreements for ATRIS Acquisitions

Type of Agreements	1. Acquisition of Secondary Information	2. Acquisition of Primary Information
Supply Agreements  (May involve dollar costs to ATRIS)	<ul style="list-style-type: none"> <li>a. DOT-NTIS agreement for machine-readable abstracts of U.S. Government reports on transportation subjects.</li> <li>b. FAA-NASA agreement for hard-copy or machine readable abstracts of air transport information not held by NTIS.</li> <li>c. ATRIS-Ei agreement for machine-readable abstracts of journal articles and conference proceedings in air transport.</li> </ul>	<ul style="list-style-type: none"> <li>a. ATRIS-Publisher agreements for purchase of primary information not covered by secondary acquisitions or by exchange agreements with information generators. Includes library acquisitions within the ATRIS institution.</li> </ul>
Exchange Agreements  (Quid pro quo)	<ul style="list-style-type: none"> <li>d. ATRIS-SSIE agreement for exchange of air transport project resumes with air-transport related project resumes.</li> <li>e. ATRIS exchange with other U.S. services (e.g. HRIS, EPA, DOE)</li> <li>f. ATRIS exchange with non-U.S. services that specialize in air transport information (e.g., ITA)</li> </ul>	<ul style="list-style-type: none"> <li>b. ATRIS agreements with generators of air transport research information (e.g. governmental agencies, consulting firms, industries, and research institutions).</li> </ul>

## 2. Input Processing Procedures

Input processing includes all operations that are performed on an acquired item of information until the processed result has been stored in a form that is ready for output processing. In general, input processing is the creation and updating of the information service data base. In the case of library services, input processing involves cataloging and shelf storage among other operations. For a computer-based abstracting and indexing service such as ATRIS, input operations depend upon the form and content of acquired items and generally include the steps that are described below.

### 2.1 Reformatting of Machine-Readable Acquisitions

Records (abstracts or resumes) that are received in machine-readable form, say, on magnetic tapes, may have formats different from those of the records in the ATRIS data base. It is therefore necessary to maintain conversion software that reformats the acquired records. The present TRB information services, for example, have a number of conversion programs that include the reformatting of NTIS, SSIE, and Ei tapes. Reformatting includes additions of data elements such as record source and printouts of the reformatted records. It is estimated that computer costs for reformatting are about ten cents per record.

### 2.2 Selection and Subject Area Classification

Selection of material for further processing implies the application of selection criteria (See page 30) to each acquired item and rejection of those items that do not meet the criteria. This step must include a redundancy check with items that have been previously stored or that are in the processing stage. The TRB services have used card indexes and microfiche images of data base records for redundancy checking; a new computer procedure is being

developed at the present time. In the TRB input system a given abstract or project resume may be selected by more than one service (e.g., HRIS and RRIS). In these cases the record is stored only once but contains codes, subject areas, and index terms for each service that has selected the input item. Input costs are shared between the services; the shared records may appear in the output products of all services involved.

Since selection is an intellectual process that requires understanding of the service subject scope, it is appropriate and efficient for the selector to assign one or more subject areas (See Table 1) at the time each selection is made. It is estimated that the selection and classification steps can be performed by an expert at the rate of twenty-five items per hour.

### 2.3 Abstracting

Although an informative abstract is needed for all ATRIS selections, abstracts cannot be created nor made more informative for selections from secondary acquisitions unless the corresponding primary information is available. It will be assumed that secondary information is not acquired unless all records have abstracts that are generally suitable for ATRIS output. Thus abstracts need to be prepared only for primary documents that are not accompanied by suitable abstracts. It is also assumed that project data acquired from primary sources, such as sponsor or performing agencies, include suitable resumes of the project work.

Based on the experience of other modal services and assuming the acquisition arrangements shown in Table 9, it is estimated that abstracts will have to be prepared for no more than twenty percent and possibly for as little as ten percent of all input selections.



Abstracting requires a high level of expertise; the average output of an expert may be two abstracts per hour, but depends upon the difficulty of the material abstracted.

#### 2.4 Indexing

Indexing is the process of listing words or phrases that represent the specific subject content of a document or project. Index terms provide the basis for retrieving all records that have been assigned a given combination of terms. When all index terms for a given collection of records are properly organized, the result is an index, or inverted file, that can be used to determine which records satisfy a given retrieval requirement.

Secondary acquisitions will generally be acquired from abstracting and indexing services and therefore already have index terms that were assigned by the supply organization. Since the supply services and ATRIS will generally have different subject scopes, it is likely that the acquired records will have some terms that are unsuitable for ATRIS scope and will fail to have some terms that are needed to represent specifics of the air transport field. It is therefore necessary for indexers to review the acquired terms and to delete or make substitutions for unsuitable terms. Indexing can be done manually or with computer assistance; index terms can be constrained by a control vocabulary or can be "freely" assigned. Controls for either manual or computer indexing can range from an elaborate and comprehensive thesaurus to a relatively short list of "do's" and "don'ts."

It is assumed that an ATRIS User Guide will be prepared and will include both explanations of how ATRIS material has been indexed and vocabulary lists of terms that have been used.

Many studies have been made of the relative effectiveness of different indexing procedures and of different types and levels of vocabulary control; most indicate that retrieval gains from a highly controlled indexing vocabulary are generally offset by the expense of developing and maintaining the vocabulary. It is recommended that the vocabulary for ATRIS indexing be relatively "free" and that the initial tool for manual indexing be simply an edited list of terms that have been used, including their frequency of use. This approach is consistent with computer indexing that is commonly used in on-line retrieval systems and in which every term of the document (or project) title and abstract becomes an index term unless it is one of a relatively small number of "stop" words.

For secondary acquisitions ATRIS indexers can edit and augment the supplied terms in the light of terms and concepts that appear in the acquired title and abstract (or resume). Thus manual indexing of a secondary acquisition is likely to give results similar to computer indexing. For primary acquisitions, the indexers can include concepts that are represented in the document but that may not occur in the abstract. Manual indexing requires subject expertise approaching that of the selection, classification, and abstracting operations. For primary documents, the abstractor should also do the indexing. Assuming that each selection will have from six to twelve index terms, it is estimated that a qualified person can index from five to ten records per hour, depending upon the extent to which the input material has been previously indexed.

## 2.5 Coding

The coding operation consists of augmenting abstracts (or resumes)

and index terms with all other data elements that are to be stored for a given record, including whatever "tags" or coordinates are needed to insure that each element gets stored in its proper place within a record. Coding tools include input worksheets that have a place for each data element and coding rules for every worksheet item. Exhibit 3 shows worksheets that are used for coding data elements of records in the TRB information services. Page 79 is for document abstracts, Page 80 is for project resumes, and Page 81 is the back side of either worksheet and provides space for abstracts or resumes and index terms. Specific rules and guidelines exist for coding every data element indicated in Exhibit 3, but are not included as part of this report. It is assumed that these rules would be a useful part of an ATRIS User Guide.

In practice it is not necessary to fill out a complete worksheet for every input item. Many elements of machine-readable acquisitions are computer coded, many elements of acquired hard-copy records can be marginally identified with worksheet positions, and remaining elements can be added without recourse to worksheets. Coding of index terms, frequently appearing organization names, and frequently appearing publication names is done via short alphabetic codes that are changed to their full length versions during the storage operation. Use of these codes saves much writing and keyboarding.

## ABSTRACT WORKSHEET

Transportation Research Board

SEGMENT & LINE										ACCESSION NUMBER										RECORD CLASSES									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
111 A																													
112																													
121										SOURCE																			
122										SOURCE DATA										III									
131										CITY										RELEASE									
211										TITLE																			
311										1 6										PUBLICATION									
312										1 5										PUBLISHER OR CORPORATE AUTHOR									
313										STREET ADDRESS OR SERIAL NO.																			
314										CITY										STATE									
315										CODE I										III									
321										VOL AND NO										1 6 REF NO									
322										PAGES										FIG.									
323										FOR LANG. OF ABSTRACT										FOR LANG. OF ABSTRACT									
331										2 4										AUTHOR NAME									
332										TITLE																			
333										1 7										AFFILIATION									
341										1 9										DOCUMENT CENTER									
342										STREET ADDRESS																			
343										CITY										STATE									
344										FORM I										FORM II									
345										CODE I										III									
452										TOTAL										FUNDING									
										ADDITIONAL LISTS																			
911 A										FILE REF										II									
911 B										DIRS ACC NUMBER										DIRS									
911 C										DIR																			
921										SERIES										RECORD									



### R & D PROJECT SUMMARY WORKSHEET

Transportation Research Board

[illegible]

[illegible]

Coding does not require subject expertise but does require thorough knowledge of input processing procedures, compliance with coding rules, and accurate work. It is estimated that input items can be coded at the average rate of ten per hour per coder.

## 2.6 Verification

Before amended records or worksheets are sent to the keyboarding operation it is necessary to verify that all data elements are properly coded—at least on a sampling basis. Verification of individual records is again required after the storage operation. It is estimated that the total time required for verification is at the rate of about twenty records per hour per person.

## 2.7 Keyboarding

The keyboarding operation changes written material into machine-readable form that can be punched cards, magnetic tape, or disk storage. The third method is now used for the TRB modal information services. The keyboarder activates a CRT terminal that is directly linked to the computer; input material is stored on magnetic disks via the IBM ATMS text editing system. Whenever the keyboarder has completed an input batch, the stored material is put out on magnetic tape and held for the storage operation.

Two levels of keyboarding are required: one is for complete worksheets (Exhibit 3), and the other is for amendments and additions to printouts of records that have been acquired in machine-readable or hard-copy form. It is estimated that keyboarding can be performed at the rate of about five items per hour and twenty items per hour per terminal for the respective types of input. Additional keyboarding is required to correct errors that still exist after the storage operation.

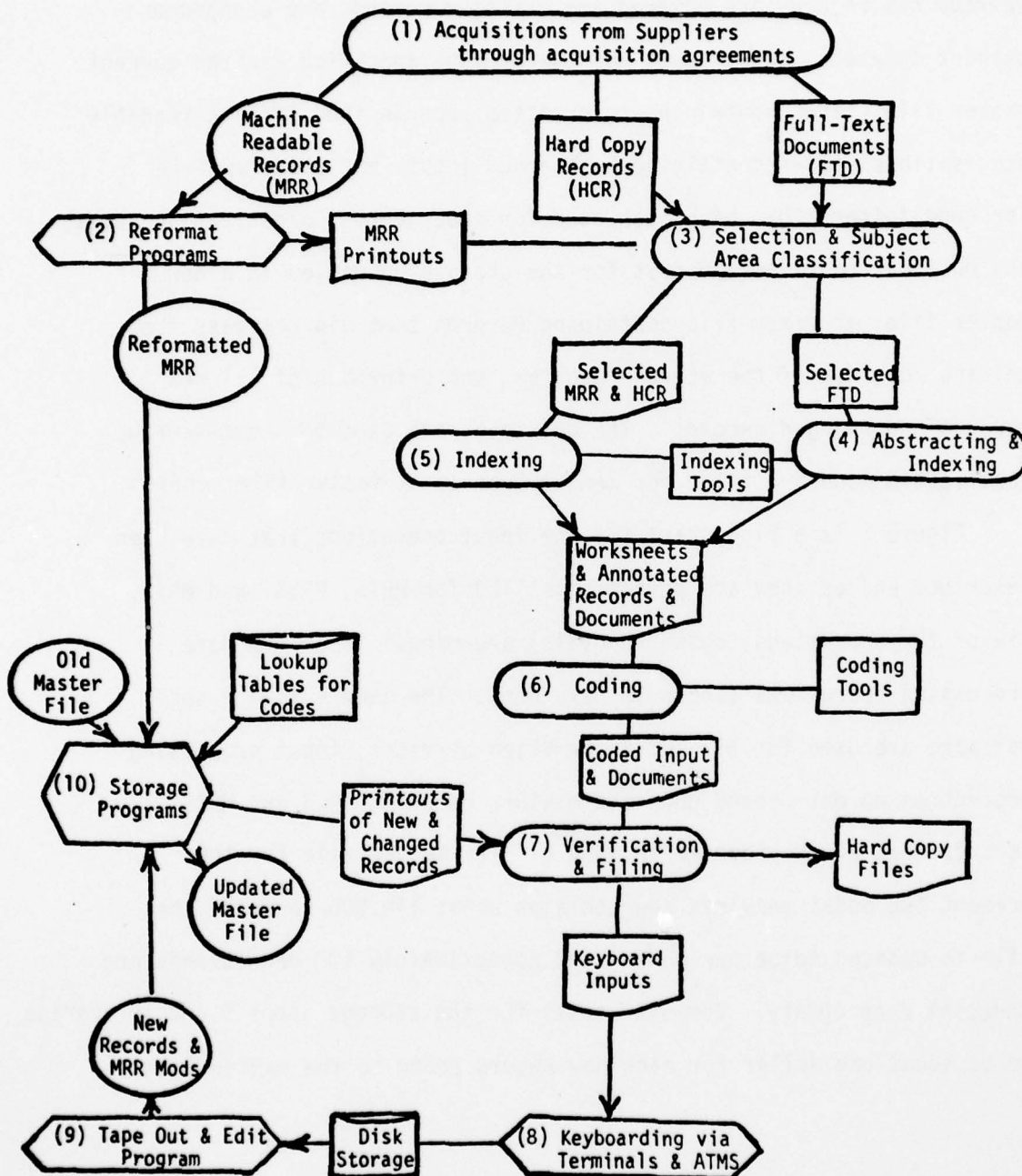
## 2.7 Storage

The storage operation is essentially an update of the master file whereby new records are entered and existing records are changed or perhaps deleted. Input items for the storage operation are the current master file, tapes containing reformatted records from machine-readable acquisitions, tapes containing keyboarded input, and a lookup file for code letters that have been used for index terms, organization names, and publication names. Output for the storage operation is a new master file, an error file containing records that did not pass the editing routines of the storage program, and printouts of all new records and changed records. The printouts are used for post-storage verification and are filed for manual look up of master file records.

Figure 5 is a flow chart for the input operations that have been described and as they are performed at TRB for HRIS, RRIS, and MRIS. Six of the operations (shown in ovals) are manual four are data processing operations (shown in hexagons). The same software and hardware are used for all TRB information services; input processing procedures do not depend upon the mixture of HRIS, RRIS, and MRIS records that are keyboarded in step 8. The master file for the present TRB modal services now contains about 110,000 records; the file is updated twice per month, and approximately 500 new records are added at each update. Computer costs for the storage steps 9 and 10 average to be about one dollar for each new record added to the master file.



Figure 5. Flow Chart for ATRIS Input Operations



## APPENDIX B. ATRIS OUTPUT OPERATIONS

This Appendix addresses specific output operations associated with ATRIS services and products that were discussed in Section 3.4 and that were listed in Table 5 on page 34.

### 1. Batch-Mode Retrieval Operations

Batch-mode retrieval implies that a number of retrieval specifications are processed in a single computer run. Each retrieval specification contains a search specification and an output specification. A search specification is a logical combination of search terms that are connected by one or another of the operators OR, AND, and NOT. Each term specifies a set of alphanumeric characters to be compared with the contents of a specific field within a master file record. If the search term contents agree with the record field contents and if the logical conditions of the specified combination of terms are met, then the record is a "hit" with respect to the search specification. The output specification indicates whether the hits are to be put out in machine-readable form or in printed form, which data elements are to be put out for any record, and in which order the elements are to appear. Most batch-mode retrieval programs also provide options for printouts of the hits (e.g., one hit per page or continuous print) and options for machine-readable output (e.g., punched cards or various tape formats).

Requests for batch-mode retrievals are generally intermittent communications from individuals outside the information service; they also include "standing orders" for certain types of information on a regular basis. In addition, retrievals are frequently made to satisfy needs within the information service. Search terms for many requests are strictly subject-oriented, some searches do not involve subject terms at all (e.g., retrieval of all non-U.S. journal articles published in 1976), and some requests involve mixtures of subject terms and other search terms. Retrieval operations will be described in terms

of software and procedures used for the TRB information services.

### 1.1 Retrieval Specification

Exhibit 4 is a retrieval specification form having three parts. The first part identifies the requester and the search title; the second part (PA line) specifies the format for retrieval output; and the third part (T lines) is for search terms, logic for combining the terms, and coordinates for the record parts that are to be compared with the search terms. The coordinates may address any line of the record (see Exhibit 3) and may start at any position within a line. Any search term may have as many as fifty characters and may consist of several words, a single word, or only the first few characters of a given word. Thus truncated search terms are a built-in feature. A maximum of fifty search terms may be used in any specification. Logic for combining terms by AND, OR, and NOT will not be described in this report, but experience has shown that the possibilities provided are adequate for all searches made to date. Output options include a variety of fixed formats, pagination alternatives, output media alternatives, and alternatives for indexes. Typical indexes are for subject terms, authors, or organizations.

Simple retrieval specifications can be prepared in five minutes or less; specifications involving subject terms require consultation with vocabulary lists and with subject matter specialists and may require more than an hour of effort. Retrieval specifications are keyboarded, edited, and corrected before being batched for the computer run.



Exhibit 4. Retrieval Specification Form (Front Side)

Retrieval ID						
1	2	3	4	5	6	7
R	0	0	0	2	2	3

RETRIEVAL SPECIFICATIONS  
Transportation Research Board  
Form 500 (November 1974)

Coder	<b>FNH</b>
Date	<b>8-24-76</b>
Reviewer	
Date	

OPERATOR INSTRUCTIONS		
Use <b>M4R</b> IRF	Decollate: <input checked="" type="radio"/> Yes <input type="radio"/> No	Tapes Out: <b>KRF IRF ITF</b>
Paper Ply: 1 <b>2</b> 4 stock	Burst: <input checked="" type="radio"/> Yes <input type="radio"/> No	Date Due:
Print Chain: Mixed Case <input checked="" type="radio"/> Upper Case (QN, Fold)	Trim: Yes <input checked="" type="radio"/> No	Unit/Fund No: <b>483240001</b>

8 9 10	Requestor's Name, Title, Organization and Mailing Address	80
N A	<b>PROF. C.H. WHITEHURST</b>	
N B	<b>DEPARTMENT OF INDUSTRIAL MANAGEMENT</b>	
N C	<b>CLEMSON UNIVERSITY</b>	
N D	<b>CLEMSON, S.C. 29631</b>	
N E		

8 9 10	Page Header (NF) and Title (NF-NI)	80
N F	<b>MULTIMODAL MERGERS</b>	
N G		
N H		
N I		

8 9	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	80
P A	<b>501</b>	<b>I</b>																															

8 9 10	Line ID	Start	Logic	Compare on	70
T 0 1	<b>1.1.1A32</b>	<b>32</b>	<b>AND 1</b>		
T 0 2	<b>6.5.5.3.1</b>	<b>3.1</b>	<b>AND MULTIMODAL TRANSPORTATION COMP</b>		
T 0 3	<b>6.5.5.3.1</b>	<b>5.5.0</b>	<b>INTERMODAL TRANSPORTATION COMP</b>		
T 0 4	<b>6.5.5.3.1</b>	<b>5.5.0</b>	<b>FREIGHTLINERS</b>		
T 0 5	<b>6.5.5.3.1</b>	<b>5.5.0</b>	<b>GOVERNMENT REGULATION</b>		
T 0 6	<b>6.5.5.3.1</b>	<b>5.5.0</b>	<b>DEREGULATION</b>		
T 0 7	<b>6.5.5.3.1</b>	<b>5.5.0</b>	<b>INTERSTATE COMMERCE COMM</b>		
T 0 8	<b>6.5.5.3.1</b>	<b>5.5.0</b>	<b>MERGER</b>		
T 0 9	<b>6.5.5.3.1</b>	<b>5.5.0</b>	<b>INDUSTRY STRUCTURE</b>		
T 1 0	<b>6.5.5.3.1</b>	<b>5.5.0</b>	<b>CONRAIL</b>		
T 1 1	<b>6.5.5.3.1</b>	<b>5.5.0</b>	<b>SOUTHERN PACIFIC</b>		
T 1 2	<b>6.5.5.3.1</b>	<b>5.5.0</b>	<b>CANADIAN NATIONAL</b>		
T 1 3	<b>6.5.5.3.1</b>	<b>5.5.0</b>	<b>CANADIAN PACIFIC</b>		
T 1 4	<b>6.5.5.3.1</b>	<b>5.5.0</b>	<b>MISSOURI PACIFIC</b>		

(Continue on back)





Exhibit 4: Retrieval Specification Form (Back Side)

8	9	10	Line ID	Start	Logic	Compare on	70
11	12	13	14	15	16	17	18
T 1	5	65	31	550	BURLINGTON NORTHERN		
T 1	6	65	31	55A	INTERMODAL		
T 1	7	65	31	550	MOTOR CARRIER		
T 1	8	65	31	550	AIR TRANSPORT		
T 1	9	65	31	550	INLAND WATER		
T 2	0	65	31	550	BARGE		
T 2	1	65	31	550	PIPELINE		
T 2	2	65	31	550	SLURRY PIPE		
T 2	3	65	31	550	MARINE		
T 2	4	65	71	55A	72		
T 2	5	65	71	550	73		
T 2	6	65	71	550	74		
T 2	7	65	71	550	75		
T 2	8	65	71	550	76		
T 2	9						
T 3	0						
T 3	1						
T 3	2						
T 3	3						
T 3	4						
T 3	5						
T 3	6						
T 3	7						
T 3	8						
T 3	9						
T 4	0						
T 4	1						
T 4	2						
T 4	3						
T 4	4						
T 4	5						
T 4	6						
T 4	7						
T 4	8						
T 4	9						
T 5	0						

T Card Instructions

CC 11-14 First four characters of TRIS worksheet lines to be searched. Use \$ for truncation, i.e., 531A or 531\$ or 53\$\$ or 53\$\$.

CC 15-16 Start position of search term. Keywords begin in 31. CC 6-20 can only be compared on 111A line

CC 17 Leave blank if search term is compared on significant characters only. Enter 2 through 9 to compare on blanks after the last significant character.

CC 18-20 Level 1 B&O A or B  
Level 2 B&A, B&N (A or B) and (C or D)  
Level 3 B&R (A and B) OR (C and D)  
Level 4 AND, NOT (A OR B) AND (C OR D)  
First T card logic must be AND or NOT

CC 21-70 Enter compare data, do not exceed 50 characters, and use \$ for blanks.

## 1.2 Search and Retrieval

As many as fifty searches can be made in a single retrieval run. Each record in the master file is compared with each search specification in the batch; if the record is a hit for one or more specifications, the entire record is put out on a hit tape. For a batch of twenty-five searches, computer costs for the operation are in the neighborhood of fifteen dollars per request, exclusive of labor and overhead costs. For the present master file size, from two to three hours are required to process twenty-five searches that yield an average of one hundred hits per search. Total retrieval costs are reflected by HRIS, RRIS, and MRIS retrieval fees that are presently \$50 per search plus twenty-five cents per printout page. Although this batch-mode retrieval system offers more flexibility for search specification and output format than most on-line retrieval systems, its greatest drawback is inability to adjust search specifications until the retrieval has been made.

## 1.3 Output Processing

The hit output tape is run against the output specification for each request to produce the printouts and tapes that have been specified. If indexes have been specified, additional runs are required to sort the index terms and put them out in printed or tape form.

For photocomposition of publications, the output records and indexes must be run through additional programs that introduce the necessary photocomposition symbols and codes.

Printed output is reviewed and screened by subject matter specialists who are conversant with the requester. Finally the printed output is packaged and transmitted to the requester. When appropriate,

printed output is supplemented with additional relevant material that is available but not represented in the master file. If the results of any retrieval printout are to be distributed to more than one user, multiple photocopies are made and transmitted. For tape outputs, say, for exchange with SSIE, output tapes may be reformatted to new formats that are specified in the exchange agreement.

Another important type of tape output is records that are transmitted for updating an on-line data base. In this case the tape transmittal by ATRIS would be in whatever format required by the on-line center.

Exhibit 5 shows the first three pages of the RRIS batch-mode retrieval that was specified in Exhibit 4.

## 2. On-Line Retrieval Operations

Since provision of on-line retrieval services requires much greater hardware-software capability than for batch-mode retrieval, it is not expected that ATRIS will provide on-line service directly to users, but rather that ATRIS should supply records to an on-line retrieval service that in turn provides on-line access to the ATRIS data base, perhaps as part of a larger data base such as TRIS-On-Line. Thus a formal agreement is made for supplying new ATRIS records to the on-line data base on a regular basis, say, monthly. Each on-line user, including ATRIS itself, makes an agreement with the on-line service for on-line access and use. Users must provide their own terminals; on-line charges are generally of the order of one dollar per minute of connect time, including communications costs but excluding off-line printouts that the user may request.

The two main advantages of on-line retrieval over batch-mode retrieval are fast turnaround and ability to adjust search strategies on the spot.

AD-A049 301

NATIONAL RESEARCH COUNCIL WASHINGTON D C  
IMPLEMENTATION PLAN FOR AN AIR TRANSPORTATION RESEARCH INFORMAT--ETC(U)  
SEP 77

F/G 1/2

DOT-FA77WA-3872

UNCLASSIFIED

FAA-EM-77-14

NL

2 of 2

AD-A049 301





Exhibit 5. RRIS Batch-mode Retrieval (Cover Page)

RUN NO. R000233

MULTIMODAL MERGERS

RRIS FILE SEARCH

PREPARED FOR

PROF. C.H. WHITEHURST  
DEPARTMENT OF INDUSTRIAL MANAGEMENT  
CLEMSON UNIVERSITY  
CLEMSON, S.C. 29631

08/25/76

Railroad Research Information Service

National Research Council

National Academy of Sciences \* National Academy of Engineering

Washington, D.C.

Exhibit 5. RRIS Batch-Mode Retrieval (Specification page)

FORM 500 CARDS

RUX NUMB. R000233

MAPPOF. C.H. WHITEHURST  
 DEPARTMENT OF INDUSTRIAL MANAGEMENT  
 MCCLENNON UNIVERSITY  
 MCCLENNON, S.C. 29631  
 WE  
 MFHULTIAOLAL MERGERS  
 NG  
 NH  
 NI  
 PA 501 7

T01 111A 32 AND 1	01 02 XX
T02 6588 31 AND MULTIMODAL TRANSPORTATION COMP	30 VV 03
T03 6588 31 O INTERMODAL TRANSPORTATION COMP	30 VV 04
T04 6588 31 O FREIGHTLINERS	13 VV 05
T05 6588 31 OR GOVERNMENT REG	14 15 06
T06 6588 31 O INTERSTATE COMMERCE COMM	24 15 07
T07 6588 31 O MERGER	06 15 08
T08 6588 31 O INDUSTRY STRUCTURE	18 15 09
T09 6588 31 O CONRAIL	07 15 10
T10 6588 31 O SOUTHERN PACIFIC	16 15 11
T11 6588 31 C CANADIAN NATIONAL	17 15 12
T12 6588 31 O CANADIAN PACIFIC	16 15 13
T13 6588 31 O MISSOURI PACIFIC	16 15 14
T14 6588 31 O BURLINGTON NORTHERN	19 15 XX
T15 6588 31 A INTERMODAL	10 23 16
T16 6588 31 O MOTOR CARRIER	13 23 17
T17 6588 31 O AIR TRANSPORT	13 23 18
T18 6588 31 O INLAND WATER	12 23 19
T19 6588 31 O BARGE	05 23 20
T20 6588 31 O PIPELINE	08 23 21
T21 6588 31 O SLURRY PIPE	11 23 22
T22 6588 31 O MARINE	06 23 XX
T23 3218 71 A 72	02 VV 24
T24 3218 71 O 73	02 VV 25
T25 3218 71 O 74	02 VV 26
T26 3218 71 O 75	02 VV 27
T27 3218 71 O 76	02 VV XX

Exhibit 5. RRIS Batch-Mode Retrieval (First hit)

27/08/76

PRIS RUN NO. R000233 SELECTIONS  
MULTIMODAL MERGERS

24 041605

A SINGLE INTERMODAL TRANSPORTATION COMPANY

Claytor, WG, Jr; President; Southern Railway

PUBLICATION:

Transportation Journal; American Society of Traffic &  
Transportation; 547 West Jackson Boulevard; Chicago,  
Illinois; 60606

Mar 72; pp 31-38

SUMMARY:

The movement of all kinds of freight in this country is carried on--and regulated--on a piecemeal basis, largely because of the historical way the various modes of transportation developed. Shippers would prefer to deal with a single source for their entire transportation package. But the only organization that can sell them total transportation would be a single intermodal transportation company, able to own and use any and all means of transportation under one management, with one sales force and one pricing policy, one accounting system and one corporate responsibility. After reviewing all the pros and cons, it can be concluded that total transportation is practical and is needed more than ever in today's complex transportation world.

SUPPLEMENTAL NOTE:

A presentation at the Eleventh Biennial Seminar of the American Society of Traffic and Transportation, Pennsylvania State University, University Park, Pennsylvania, September 10, 1971.

SOURCE:

Transportation Journal

AVAILABILITY:

American Society of Traffic & Transportation; 547 West Jackson Boulevard; Chicago, Illinois; 60606; Repr PC; \$2.50; DOTL  
JC

RRIS SUBJECT TERMS:

TRANSPORTATION SYSTEMS PLANNING; INTERMODAL TRANSPORTATION  
COMPANIES

Batch-mode retrieval systems can be developed to provide a wider range of output formats (e.g., page size, data elements display, tape output, and indexes) than is generally available in on-line systems. On-line retrieval generally abstract), but batch-mode retrieval can provide search capability for record elements that are not search terms in the on-line mode. It seems reasonable to assume that on-line use will grow, some users will continue to request batch-mode retrievals, and the information service itself will necessarily need batch-mode capability for jobs that cannot be accomplished in the on-line mode.

Exhibit 6 shows terminal messages and illustrative output for the on-line counterpart of the RRIS retrieval that was illustrated in Exhibit 5.

### 3. Publications

It is conventional for abstracting and indexing services such as ATRIS to produce two types of publications. One is a regular bulletin that contains an organized and indexed compilation of all records that have been stored during a specific time period that might be one month, two months, three months, six months, or even one year. The "chapters" of each bulletin are generally the subject areas that cover the service scope; indexes are alphabetical listings of all subject terms that have been assigned to the records that appear in the bulletin. Thus subscribers to the service bulletins are provided current awareness of all material that has been stored and have, in fact, a shelf version of the service master file. If cumulative indexes are provided, say on an annual or biennial basis, bulletin subscribers can do simple searches that involve perhaps only one or two subject areas and/or index terms. While these bulletins are not effective for specific needs that are met by retrieval services, they can meet the browsing and minimal retrieval needs



Exhibit 6. RRIS On-Line Retrieval (First Page)

BATTELLE INTERCOM 4.5

DATE 06/20/77

TIME 16.06.17.

PLEASE LOGIN

LOGIN SUP,N

COMMAND- BASIS,HANKINS,TRIS

B A S I S

WELCOME TO TRIS-ON-LINE

LATEST UPDATE = 05 26 77; TOTAL ITEMS IN DATA BASE = 82,075

THE TRIS-ON-LINE DATA BASE CONTAINS TRANSPORTATION INFORMATION  
OF THE FOLLOWING TYPES:

A. WORK IN PROGRESS RESUMES (10,859 ITEMS)

B. TRANSPORTATION LITERATURE ABSTRACTS (71,216 ITEMS)

DO YOU WANT TO SEE DESCRIPTIONS OF THE TYPES?

PLEASE ANSWER YES OR NO

/ NO

WHICH TYPE(S) DO YOU WISH TO SEARCH?

ENTER LETTER (A OR B) OR ALL

/ ALL

ENTER YOUR REQUESTS ONE AT A TIME

1/ 1114,1130

11103 ITEMS

2/ 6000,MULTIMODAL TRANSPORTATION COMPANIES

1 ITEM

3/ 6000,INTERMODAL TRANSPORTATION COMPANIES

8 ITEMS

4/ FREIGHTLINERS

10 ITEMS

5/ 6000,FREIGHTLINERS

14 ITEMS

6/ (2030405)

26 ITEMS

7/ 6000,GOVERNMENT REGULATIONS

154 ITEMS

8/ 6000,INTERSTATE COMMERCE COMMISSION

79 ITEMS

9/ MERGERS

30 ITEMS

10/ 6000,MERGERS

24 ITEMS

11/ 6000,INDUSTRY STRUCTURE

43 ITEMS

12/ CONRAIL

39 ITEMS

Exhibit 7. RRIS On-Line Retrieval (Second Page)

- 13/ 6000, CONRAIL  
44 ITEMS
- 14/ 6000, SOUTHERN PACIFIC TRANSPORTATION COMPANY  
29 ITEMS
- 15/ 6000, CANADIAN NATIONAL RAILWAYS  
42 ITEMS
- 16/ 6000, CANADIAN PACIFIC  
24 ITEMS
- 17/ 6000, MISSOURI PACIFIC RAILROAD  
29 ITEMS
- 18/ 6000, BURLINGTON NORTHERN  
18 ITEMS
- 19/ (70809010011012013014015016017018)  
425 ITEMS
- 20/ INTERMODAL  
283 ITEMS
- 21/ 6000, MOTOR CARRIERS  
141 ITEMS
- 22/ 6000, MOTOR CARRIER INFORMATION SYSTEMS  
1 ITEM
- 23/ 6000, AIR TRANSPORT  
26 ITEMS
- 24/ 6000, INLAND WATERWAYS  
104 ITEMS
- 25/ 6000, INLAND WATERWAYS ECONOMICS  
7 ITEMS
- 26/ BARGE  
138 ITEMS
- 27/ PIPELINES  
222 ITEMS
- 28/ 6000, PIPELINES  
190 ITEMS
- 29/ 6000, SLURRY PIPELINES  
29 ITEMS
- 30/ MARINE  
909 ITEMS
- 31/ (20021022023024025026027028029030)  
1770 ITEMS
- 32/ 3217, 720000/760000  
34948 ITEMS
- 33/ (19A31A32)  
25 ITEMS
- 34/ (6033)  
49 ITEMS
- 35/ (1A34)  
44 ITEMS
- 36/ DISPLAY

WHAT FIELDS DO YOU WANT TO SEE?

PRINT OPTIONS FOR THE TRIS DATA BASE ARE...

SHORT FORMAT (ENTER NUMBER 1)

LONG FORMAT (ENTER NUMBER 2)

MANAGEMENT FORMAT (ENTER NUMBER 3)

ENTER FIELD NUMBERS SEPARATED BY COMMAS OR ALL

/ 1110

THIS PRINTOUT MAY BE LENGTHY

44 ITEMS

HOW MANY ITEMS DO YOU WANT FIRST?

/ ALL

Exhibit 7. RRIS On-Line Retrieval (Third Page)

ACCESSION NUMBERS IN TRIS ARE -

41605	41606	43283	44042	47934	50853	50855
51378	53795	53880	54610	54764	54933	57330
57670	57855	57856	84738	95201	95204	95231
95422	96550	96640	99843	99846	99871	125872
126423	126436	126439	129262	129324	131031	131324
134305	134556	141558	142937	142941	142943	145170
147899	148289					

FINISHED WITH PRINT OUT

ENTER YOUR REQUEST

36/ DISPLAY (41605)

WHAT FIELDS DO YOU WANT TO SEE?

/ 2

ITEMS FROM THE TRIS DATA BASE

ITEM 1

ACCESSION NUMBER : 41605

REPORTING ORGANIZATION/SOURCE : TRANSPORTATION JOURNAL

TITLE : A SINGLE INTERMODAL TRANSPORTATION COMPANY

PUBLICATION NAME : TRANSPORTATION JOURNAL

PUBLISHER/CORPORATE AUTHOR : AMERICAN SOCIETY OF TRAFFIC &  
TRANSPORTATION

PUBLICATION DATE : 720300

DOCUMENT DATA : PP 31-38

AUTHOR : CLAYTOR, WG, JR

DOCUMENT CENTER/AVAILABILITY : AMERICAN SOCIETY OF TRAFFIC &  
TRANSPORTATION

SUMMARY OR ABSTRACT : THE MOVEMENT OF ALL KINDS OF FREIGHT IN THIS COUNTRY IS CARRIED ON--AND REGULATED--ON A PIECEMEAL BASIS, LARGELY BECAUSE OF THE HISTORICAL WAY THE VARIOUS MODES OF TRANSPORTATION DEVELOPED. SHIPPERS WOULD PREFER TO DEAL WITH A SINGLE SOURCE FOR THEIR ENTIRE TRANSPORTATION PACKAGE. BUT THE ONLY ORGANIZATION THAT CAN SELL THEM TOTAL TRANSPORTATION WOULD BE A SINGLE INTERMODAL TRANSPORTATION COMPANY, ABLE TO OWN AND USE ANY AND ALL MEANS OF TRANSPORTATION UNDER ONE MANAGEMENT, WITH ONE SALES FORCE AND ONE PRICING POLICY, ONE ACCOUNTING SYSTEM AND ONE CORPORATE RESPONSIBILITY. AFTER REVIEWING ALL THE PROS AND CONS, IT CAN BE CONCLUDED THAT TOTAL TRANSPORTATION IS PRACTICAL AND IS NEEDED MORE THAN EVER IN TODAY'S COMPLEX TRANSPORTATION WORLD.

SUPPLEMENTARY NOTE : A PRESENTATION AT THE ELEVENTH BIENNIAL SEMINAR OF THE AMERICAN SOCIETY OF TRAFFIC AND TRANSPORTATION, PENNSYLVANIA STATE UNIVERSITY, UNIVERSITY PARK, PENNSYLVANIA, SEPTEMBER 10, 1971.

FINISHED WITH PRINT OUT

ENTER YOUR REQUEST

36/ LOGOUT

THE TOLL FREE TELEPHONE NUMBER FOR GENERAL INFORMATION CONCERNING TRIS-ON-LINE IS 1-800-225-1612. MASSACHUSETTS CALLERS SHOULD DIAL 1-800-842-1151. SYSTEMS PROBLEMS, HOWEVER, SHOULD BE REFERRED TO BATTELLE AT (614) 424-7675.

CONNECT TIME 0 HRS. 20 MIN.

GOODBYE

A second type of publication is represented by special bibliographies that cover only specified parts of the total information scope of the service. These publications contain all records that have been stored over time within the bibliography scope. While special bibliographies are generally defined by a specified subject scope, they can also be defined by information types (e.g., project resumes, non-U.S. material, or planning documents). The processing steps for either type of publication are essentially the same and are listed below.

### 3.1 Retrieval

The first step in preparing a publication is to specify the retrieval of all records that are to appear in the publication. Search specifications and output specifications are made as described in the first section of this Appendix.

### 3.2 Editing and Preparation of Camera-Ready Copy

Printouts of the retrieval material are edited and corrections are made for errors that were not caught on the input side. If photocomposition is used to produce camera ready copy, retrieval output tapes are passed through computer programs that introduce codes for type fonts, page and topic headings, etc. The TRB program library now contains several such programs; each is customized for particular HRIS, MRIS, and RRIS publications.

If photocomposition is not used, then the "cut and paste" approach is used with the computer printout itself. Although this method costs perhaps only half as much per page as photocomposition, more pages are required for the same number of records and the product is much less satisfactory to most readers. Photocomposition costs are in the neighborhood of five dollars per camera ready page.



Camera-ready copy must also be prepared for the front matter and any special features beyond the main contents of a bulletin or bibliography.

### 3.3 Printing and Distribution

Printing and binding costs for a bulletin or bibliography depend on its size, the type of paper and covers used, and the number of copies printed.

Printing and binding may cost three dollars per copy for one thousand copies of a three hundred page bulletin and somewhat more than one dollar per copy for five hundred copies of a fifty page bulletin, exclusive of overhead costs.

A computer based information service should maintain at least two machine-readable files for producing mailing labels; one file is for the subscribers to service publications, and the other is for publicity and marketing mailings. If ATRIS experience is similar to that of other TRB information services, it is estimated that the ATRIS subscriber list eventually will include 500 or more organizations in the United States and abroad and that the public information list will include at least 2,000 organizations. Appendix C to this report is a preliminary list of the second type.

Exhibit 7 shows selected pages from the semiannual publication, MRIS Abstracts.

Exhibit 7. MRIS Publication (Cover Page)

# MRIS ABSTRACTS

**VOLUME 15**

**JUNE 1977**

The MARITIME RESEARCH INFORMATION SERVICE (MRIS) is a system for acquisition, selection, storage, retrieval, and dissemination of references to proposed, ongoing, and completed research and development projects and to technical reports and journal articles in the maritime field. The system is designed to provide coordinated and comprehensive information on what has been and is being done, by whom, and where for those engaged in maritime industry research and for development program planners, administrators, and researchers in the transportation field and in related fields of study. Financial support for the operation of this service within the Transportation Research Board is provided by the Maritime Administration, U.S. Department of Commerce.

**TRANSPORTATION RESEARCH BOARD**  
COMMISSION ON SOCIOTECHNICAL SYSTEMS • NATIONAL RESEARCH COUNCIL  
NATIONAL ACADEMY OF SCIENCES • NATIONAL ACADEMY OF ENGINEERING

Washington, D.C.

Exhibit 7. MRIS Publication (Contents Page)

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Exhibit 7. MRIS Publication (Abstracts Page)

Arctic and Cold Weather Operations

01 142839

ICE BREAKING CARGO VESSEL SOON A REALITY

Destined for service in 1978, the 28,000 dwt bulk carrier MV "Arctic" is being built by Porter Weller Drydocks Ltd. of St. Catharines, Ontario to an estimated cost of \$40 million. Contrary to ice-strengthened vessels the "Arctic" will be a pioneer in her own right. She will be the world's first heavy ice-breaking cargo vessel designed to operate in high Arctic waters independent of icebreakers. The vessel will serve as a prototype for large vessels expected to be needed for the movement of gas and oil out of the Arctic to south Canada to meet future energy requirements. It will also be used to determine more accurately the ice navigation regulations promulgated under the Arctic Waters Pollution Prevention Regulations. The ship is specifically designed to carry lead-zinc ore rather than iron ore. The ship is double-hulled to reduce the risk of pollution in the event of damage. An air-bubbling system to reduce friction as the ship passes through the ice will be used, together with a special steering nozzle round the controllable-pitch propeller to increase thrust at low speed. She will be able to maintain 3 knots through 2-foot thick ice. Cargoes will be loaded and unloaded by the vessel's own cranes. She has a cruising range of 13,500 nautical miles and fuel consumption at 10,800 BHP, loaded speed approximately 16 knots, will be about 38 tons per day. The "Arctic" is designed to operate 5 months out of the year, without icebreaker support. The vessel will be operated by consortium of Canadian companies, the Federal Commerce & Navigation (1974) Ltd., Canada Steamship Lines, both of Montreal, and Leitch Transport Ltd. of Toronto.

Marine Equipment News Oct. 1976, p 10

ACKNOWLEDGMENT: Marine Equipment News  
ORDER FROM: Symcon Publishing Company, Berth 84, Box 1800, San Pedro, California, 90733

01 144305

THEORETICAL MODEL OF RIVER ICE JAMS

A mathematical analysis is developed to describe the evolution and characteristics of river ice jams. The principal components of the analytical model are the static force equilibrium of the fragmented ice cover; the unsteady continuity equations for the frozen and liquid water; the nonuniform unsteady momentum relation for the flow; and relations in which compressive and shear strengths of the floating fragmented ice cover vary linearly with local jam thickness. A numerical method is outlined for solving the equations for the case in which the jam has evolved to the point that it propagates upstream with constant velocity (quasi-steady conditions), and a complete set of example results is presented for a specific flow and channel. Estimates are derived for the time required for the jam to evolve to the quasi-steady state and for the velocity of the jam front during the evolutionary stage.

Uzunier, MS (Arctec, Incorporated) ASCE Journal of the Hydraulics Division Vol. 102 No. 9, Sept. 1976, pp 1365-83, 12 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

01 147527

ARCTIC SURFACE EFFECT VEHICLE PROGRAM

First-hand experience was gained in the Arctic during a six-month test program with an SK-5 SEV at Barrow, Alaska. Designs for SEV's up to 1000-tons gross weight with speed capabilities up to 120 knots were prepared. Numerous skirt designs were tested over simulated terrain to establish feasibility of skirts higher than those currently in use. The prediction of the dynamic response of SEV's operating at high speeds over ice and other rough terrain required analytical programs different from those used for operations over water. The detection of ice ridges and estimation of their height is required for high speed operation, and a system utilizing a 95GHz radar was designed and tested. Specific designs of 150-ton and 500-ton vehicles were developed to establish their feasibility for conducting long-range Arctic missions.

Kordenbrock, JU Harry, CW Naval Engineers Journal Vol. 88 No. 2, Apr. 1976, pp 70-83, 13 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

01 147888

ICE FORECASTING TECHNIQUES FOR THE ARCTIC SEAS

Contents: Method for calculating the distribution of ice thickness in the Arctic Seas during the Winter period; Methods of long-term hydrometeorological forecasts for the Arctic; Utilization of the numerical method of calculation for the prognosis of autumn-winter ice conditions in the Arctic Seas; Peculiarities of ice formation in the Arctic Seas; On the close relationship between the mean monthly air temperature of Polar stations in the region of Franz Josef Land; On the importance of planetary force in the changes in the ice cover of the Arctic Seas; On the importance of using characteristics of Atlantic waters as a forecasting factor; On the stability of ten-day temperatures in the Eastern Arctic; A method of calculation of ice conditions (on the example of the Laptev Sea).

Trans. from Glavnoe upravlenie gidrometeorologicheskoi sluzhby (USSR) n292 1950. Sponsored in part by National Science Foundation, Washington, D.C. Special Foreign Currency Science Information Program.

National Science Foundation TT-75-52077, 1976, 236 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-256728-T/GA

01 147889

INDICATORS FOR FORECASTING SHIP ICING [Metodicheskie ukazaniia po preduprezhdeniiu ugrozy obledeneniia sudov]

The USSR Hydrometeorological Center has twice published "Tentative Instructions on Warning of a Possible Icing of Ships" (in 1967 and 1969) and each time, the instructions were subjected to verification under the conditions of the actual operation of the forecasting agencies of our service. In all for the four cold seasons, the USSR Hydrometeorological Center received more than 3,000 questionnaires concerning the icing of ships. The Hydrometeorological Service also collected and collated the observational data concerning the icing of ships. On the basis of the data indicated above, the third "Procedural Instructions" was published. By comparison with the previous publications of "Tentative Instructions", this version has been considerably revised and supplemented. The section on estimating the wave action which was included in this second publication has now been eliminated since in the recommendations given on the estimation and prediction of icing, wave action has been disregarded.

Trans. of Glavnoye upravleniye gidrometeorologicheskoy sluzh-by pri sovete ministrov SSSR 981 p 1972.

Borisenkov, Ye P Pchelko, IG  
Cold Regions Research and Engineering Laboratory CRREL-TL-481, June 1975, 65 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

AD-A030113/5GA

01 148459

PROFILE OF ICEBREAKER FUJI

The icebreaker Fuji was built in 1965 and since then has been involved in survey work in the Antarctic. Her principal particulars are: Length-100 m; Breadth-22 m; Draught-8.81 m; Displacement-8,838 tons; Machinery output-4 x 3,500 hp at 600 rpm; Speed-17 knots. Details of the ship's hull form, operating performance, icebreaking performance in different ice thicknesses, air transportation facilities, and survey equipment are included. [Japanese]

Honda, T Sekai No Kansen Vol. 12 No. 220, 1975, 6 pp

ACKNOWLEDGMENT: British Ship Research Association  
ORDER FROM: British Ship Research Association, WallSEND Research Station, WallSEND, England

45,028

01 148561

ICE DYNAMICS IN THE CANADIAN ARCHIPELAGO AND ADJACENT ARCTIC BASIN AS DETERMINED BY ERTS-1 OBSERVATIONS

ERTS-1 "Quicklook" imagery for the period March to November 1973 has been utilized to study sea ice in the Canadian archipelago and adjacent Arctic basin. The imagery, which provides extensive coverage of the area of interest, contains detailed information on variations in sea ice dynamics and



# Exhibit 7. MRIS Publication (Index Page)

## Source Index

**ANALYTICAL CHEMISTRY** American Chemical Society; 1155 16th Street, NW; Washington, D.C., 20036  
14 148185

**ANTI-CORROSION METHODS AND MATERIALS** Sawell Publications Limited; 4 Ludgate Circus; London EC4, England  
05 149770

**APPLIED MECHANICS REVIEWS** American Society of Mechanical Engineers; 345 East 47th Street; New York, New York, 10017  
22 147792

**ARCTEC, INCORPORATED** Suite 255, Wilde Lake Village Green; Columbia, Maryland, 21043  
14 147281

**ARCTIC INSTITUTE OF NORTH AMERICA** 3426 North Washington Boulevard; Arlington, Virginia, 22201  
01 151963, 01 151964, 01 151965, 01 151970

**ARGONNE NATIONAL LABORATORIES** 9700 South Cass Avenue; Argonne, Illinois, 60439  
08 146598

**ARIZONA UNIVERSITY** University Archives; Tucson, Arizona, 85721  
10 151578

**ARMAMENT DEVELOPMENT AND TEST CENTER** Eglin AFB, Florida  
20 147041

**ARMY COASTAL ENGINEERING RESEARCH CENTER** Fort Belvoir, Virginia  
15 146268

**ASCE CIVIL ENGINEERING** American Society of Civil Engineers; 345 East 47th Street; New York, New York, 10017  
05 147847, 07 147852, 15 147848, 15 147849, 15 147850, 15 147851, 15 147853, 18 149761

**ASCE JOURNAL OF THE HYDRAULICS DIVISION** American Society of Civil Engineers; 345 East 47th Street; New York, New York, 10017  
01 144305

**ASCE JOURNAL OF WATERWAYS, HARBORS & COAST ENG DIV** American Society of Civil Engineers; 345 East 47th Street; New York, New York, 10017  
14 147765, 15 147764, 15 147766, 19 152594, 21 142332

**ASEA JOURNAL** Allmanna Svenska Elektriska Aktiebolaget; S-72183 Vasteras, Sweden  
17 149339

**ASEA NEWS** ASEA Incorporated; 4 New King Street; White Plains, New York, 10604  
06 149637

**ASME JOURNAL OF ENGINEERING FOR INDUSTRY** American Society of Mechanical Engineers; 345 East 47th Street; New York, New York, 10017  
17 152689

**ASME JOURNAL OF MECHANICAL ENGINEERING** American Society of Mechanical Engineers; 345 East 47th Street; New York, New York, 10017  
06 148170, 17 149311

**ASSOCIATION TECHNIQUE MARITIME ET AERONAUT.**  
**BULL** Association Technique Maritime et Aeronautique; 47 rue de Monceau; 75008 Paris, France  
05 144302, 18 144303

**ATLANTIC RESEARCH CORPORATION** 5390 Cherokee Avenue; Alexandria, Virginia, 22314  
18 148177

**AUTOMOBILISMO E AUTOMOBILISMO INDUSTRIALE** Automobile Club d'Italia; Via Marsala 8; 00185 Rome, Italy  
24 145439

**AUTOMOTIVE ENGINEERING** Society of Automotive Engineers; 400 Commonwealth Drive; Warrendale, Pennsylvania, 15096  
17 151967

**AVIATION WEEK AND SPACE TECHNOLOGY** McGraw-Hill, Incorporated; 1221 Avenue of the Americas; New York, New York, 10020  
07 148836

## B

**BABCOCK AND WILCOX COMPANY** Alliance Research Center; Alliance, Ohio, 44601  
17 147558

**BABCOCK AND WILCOX COMPANY** P.O. Box 1260; Lynchburg, Virginia, 24504  
18 143328, 18 151584

**BALLINGER PUBLISHING COMPANY** 17 Dunster Street, Harvard Square; Cambridge, Massachusetts, 07138  
24 148483

**BARBER-COLMAN COMPANY** Resource Recovery Systems Division; Irvine, California  
14 144369

**BATTELLE COLUMBUS LABORATORIES** 505 King Avenue; Columbus, Ohio, 43201  
18 141585, 18 147355, 18 147887, 19 141586, 23 148279, 23 148280

**BATTELLE MEMORIAL INSTITUTE** 505 King Avenue; Columbus, Ohio, 43201  
05A 053511

**BATTELLE-NORTHWEST** Pacific Northwest Laboratory; Richland, Washington  
14 145866, 14 145867, 14 145868, 14 145869, 14 150826

**BECKMAN INSTRUMENTS INCORPORATED** Advanced Technology Operations; Anaheim, California  
14 144371

**BERMUDA BIOLOGICAL STATION FOR RESEARCH** St George's West, Bermuda  
14 143678

**BETHLEHEM STEEL CORPORATION** Sparrows Point, Maryland  
19 151314, 19 151315, 19 151316

**BLACKWELL (BASIL) AND MOTT LIMITED** 108 Cowley Road; Oxford OX4 1JF, England  
11 148480

**BOEING COMMERCIAL AIRPLANE COMPANY** P.O. Box 3707; Seattle, Washington, 98124  
19 148192

**BOLT, BERANEK AND NEWMAN, INCORPORATED** Canoga Park, California, 91303  
14 145736

**BRITISH COLUMBIA UNIVERSITY, CANADA** Center for Transportation Studies; Vancouver V6T 1W5, British Columbia, Canada  
24 142917

**BRITISH INSTITUTE OF INTL & COMPARATIVE LAW** 32 Furnal Street; London EC4A 1JN, England  
14 142918, 14 142919, 14 142920

**BRITISH SHIP RESEARCH ASSOCIATION** Wallsend Research Station; Wallsend, England  
20 148471

**BROWN BOVERI AND COMPANY** CH-5401 Baden, Switzerland  
04 149638

**BULLETIN TECHNIQUE DU BUREAU VERITAS** Bureau Veritas; 31 rue Henri-Rochefort; Paris 17e, France  
07 149597, 19 149596, 19 149598, 19 149601, 20 149595, 20 149599, 23 149600, 20 149772

**BUREAU OF MINES** C Street Between 18th and 19th, NW; Washington, D.C., 20241  
24 141451

## C

**CACI, INCORPORATED** 1815 North Fort Myer Drive; Arlington, Virginia, 22209  
15 148411, 15A 059718

**CALIFORNIA INSTITUTE OF TECHNOLOGY** Division of Engineering and Applied Science; Pasadena, California, 91125  
20 144365, 20 150821, 23 147783

**CALIFORNIA INSTITUTE OF TECHNOLOGY** Graduate Aeronautical Laboratories; Pasadena, California, 91125  
20 142814

**CALIFORNIA STATE DEPT OF NAVIGATION & OCEAN**  
**DEVEL** Sacramento, California, 95814  
05 143652, 15 143650, 15 146629

**CALIFORNIA UNIVERSITY, BERKELEY** Berkeley, California, 94720  
01 152767, 15 152772, 17 152775, 19 152766, 20 152750, 20 152751, 20 152752, 20 152753, 20 152754, 20 152755, 20 152756, 20 152757, 20 152758, 20 152759, 20 152760, 20 152762, 20 152764, 20 152765, 20 152768, 20 152769, 20 152770, 20 152771, 20 152773, 20 152774, 23 152761, 23 152763

**CALIFORNIA UNIVERSITY, BERKELEY** Hydraulic Engineering Laboratory; Berkeley, California, 94720  
20 151522

**CALIFORNIA UNIVERSITY, BERKELEY** Operations Research Center, Berkeley, California, 94720  
15 145744, 19 145693

**CALIFORNIA UNIVERSITY, BERKELEY** Structural Engineering Laboratory; Berkeley, California, 94720  
15 141612

**CALIFORNIA UNIVERSITY, SAN DIEGO** Institute of Marine Resources, La Jolla, California, 92037  
05 143652, 15 143650, 15 146629

**CANADA, GOVERNMENT OF, OTTAWA** Ottawa, Ontario, Canada  
14 147569

#### 4. Auxiliary Products and Services

Definition and implementation of auxiliary products and services can be in response to user wants and needs that are identified through ATRIS interactions with the user community, or can be innovations that are introduced as "trial balloons" for user acceptance. Some auxiliaries may be derivatives of the ATRIS data base, others may be tools that are used in ATRIS operations, some may result from special projects performed by the ATRIS staff, and others may reflect cooperation between ATRIS and other information services. Several possibilities in each category are listed below.

##### 4.1 Derivatives of the ATRIS Data Base

- (a) Microfiche versions of publications or other subsets of the data base.
- (b) Cumulative indexes for subject terms, authors, sources, etc.
- (c) Cross modal products derived from ATRIS and other data bases.
- (d) Analyses of recorded data such as research project funding.

##### 4.2 Tools Used in ATRIS Operations

- (a) Source lists that show acquisition quantities from each source.
- (b) Vocabulary lists that show frequency of use for each term.
- (c) Classified directory for organizations on the ATRIS mailing list.

##### 4.3 Results of Staff Studies or Projects

- (a) Analyses of information needs and wants of air transport information users.
- (b) User Guide for ATRIS services and products.

##### 4.4 Services in Cooperation with Other Information Centers

- (a) Document delivery services that are provided to ATRIS users by the libraries and document centers. Examples are the nodes of the TRISNET Document Delivery Services, and the Engineering Societies Library document services for references produced by Engineering Index.
- (b) Referral services whereby clients of a referral center are referred to ATRIS for specific information on air transport.

#### APPENDIX C. PRELIMINARY LIST OF POTENTIAL USER ORGANIZATIONS

The list of organizations given in this appendix has been compiled from nominations made by individual members of the ATRIS Committee and from existing lists that have been provided by or suggested by the Committee. The purpose of the list is to define a target clientele for ATRIS publicity and for distribution of initial products. It is expected that the preliminary list will be modified and extended through successive updates and that further identification and classification data will be introduced as feedback is acquired from the organizations listed.

The preliminary list is presented in seven categories as shown below.

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		<hr/>
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# 1. U.S. FEDERAL AGENCIES

U.S. Dept. of Agriculture Washington, DC	U.S. Dept. of the Air Force USAF Academy, CO	U.S. Dept. of the Air Force St. Louis, MO
U.S. Dept. of the Air Force Edwards AFB, CA	U.S. Dept. of the Air Force New York, NY	U.S. Dept. of the Air Force Andrews AFB, Washington, DC
U.S. Dept. of the Air Force Arlington, VA	U.S. Dept. of the Air Force Brussels, Belg. APO NY, NY	U.S. Dept. of the Air Force Eglin AFB, FL
U.S. Dept. of the Air Force Griffiss AFB, NY	U.S. Dept. of the Air Force Bedford, MA	U.S. Dept. of the Air Force Holloman AFB, NM
U.S. Dept. of the Air Force Kirtland AFB, NM	U.S. Dept. of the Air Force Vandenberg AFB, CA	U.S. Dept. of the Air Force Wright-Patterson AFB, OH
U.S. Dept. of the Air Force Hanscom AFB, MA	U.S. Dept. of the Air Force Brooks AFB, TX	U.S. Dept. of the Air Force Maxwell AFB, AL
U.S. Dept. of the Air Force Arnold AF Station, TN	U.S. Dept. of the Air Force Ellington AFB, TX	U.S. Dept. of the Air Force Tinker AFB, OK
U.S. Dept. of the Air Force Langley AFB, VA	U.S. Dept. of the Air Force Offutt AFB, NE	U.S. Dept. of the Air Force Shaw AFB, SC
U.S. Dept. of the Army Corpus Christi, TX	U.S. Dept. of the Army Fort Bliss, TX	U.S. Dept. of the Army Dover, NJ
U.S. Dept. of the Army Edwards AFB, CA	U.S. Dept. of the Army Fort Eustis, VA	U.S. Dept. of the Army Fort Rucker, AL
U.S. Dept. of the Army St. Louis, MO	U.S. Dept. of the Army Washington, DC	U.S. Dept. of the Army Aberdeen Prov. Grd, MD
U.S. Dept. of the Army Fort Rucker, AL	U.S. Dept. of the Army Vicksburg, MS	U.S. Dept. of the Army Ft. Monmouth, NJ
U.S. Dept. of the Army Charlottesville, VA	U.S. Dept. of the Army Redstone Arsenal, AL	U.S. Dept. of the Army Durham, NC
U.S. Dept. of the Army White Sands MR, NM	Central Intelligence Agency Washington, DC	Civil Aeronautics Board Washington, DC
U.S. Dept. of Commerce Boulder, CO	U.S. Dept. of Commerce Washington, DC	Congressional Budget Office Washington, DC
U.S. Dept. of Defense Reston, VA	U.S. Dept. of Defense Washington, DC	U.S. Dept. of Energy Washington, DC
U.S. EPA Office of Policy Analysis Washington, DC	U.S. General Services Admin. San Francisco, CA	U.S. Dept. of Housing & Urban Dev. Washington, DC
Idaho National Engineering Lab. Idaho Falls, ID	U.S. Advisory Commission on Inter- governmental Relations Washington, DC	U.S. Dept. of the Interior Flagstaff, AZ
Interstate Commerce Comm. Washington, DC	U.S. Dept. of Justice Washington, DC	U.S. Nat'l Aero. & Space Admin. Baltimore, MD
U.S. Nat'l Aero. & Space Admin. Cleveland, OH	U.S. Nat'l Aero. & Space Admin. College Park, MD	U.S. Nat'l Aero. & Space Admin. Edwards, CA
U.S. Nat'l Aero. & Space Admin. Greenbelt, MD	U.S. Nat'l Aero. & Space Admin. Hampton, VA	U.S. Nat'l Aero. & Space Admin. Houston, TX
U.S. Nat'l Aero. & Space Admin. Huntsville, AL	U.S. Nat'l Aero. & Space Admin. Indianapolis, IN	U.S. Nat'l Aero. & Space Admin. Kauai, HI
U.S. Nat'l Aero. & Space Admin. Kennedy Space Center, FL	U.S. Nat'l Aero. & Space Admin. Moffett Field, CA	U.S. Nat'l Aero. & Space Admin. Research Triangle Park, NC
U.S. Nat'l Aero. & Space Admin. Wallops Island, VA	U.S. Nat'l Aero. & Space Admin. Washington, DC	National Bureau of Economic Research Washington, DC
National Bureau of Standards Washington, DC	National Council of Phys. Distr. Mgt. Chicago, IL	National Transportation Policy Study Comm. Washington, DC
Nat'l Transportation Safety Bd. Washington, DC	U.S. Dept. of the Navy Pensacola, FL	U.S. Dept. of the Navy Johnsville, PA
U.S. Dept. of the Navy Warminster, PA	U.S. Dept. of the Navy Philadelphia, PA	U.S. Dept. of the Navy Trenton, NJ
U.S. Dept. of the Navy Norfolk, VA	U.S. Dept. of the Navy Alameda, CA	U.S. Dept. of the Navy Arlington, VA
U.S. Dept. of the Navy Jacksonville, FL	U.S. Dept. of the Navy Patuxent River, MD	U.S. Dept. of the Navy San Diego, CA
U.S. Dept. of the Navy Norfolk, VA	U.S. Dept. of the Navy San Diego, CA	U.S. Dept. of the Navy Norfolk, VA



1. U.S. FEDERAL AGENCIES (Continued)

U.S. Dept. of the Navy  
Indianapolis, IN

U.S. Dept. of the Navy  
Vallejo, CA

U.S. Dept. of the Navy  
Dahlgren, VA

U.S. Dept. of the Navy  
China Lake, CA

U.S. Congress (Library of)  
Washington, DC

U.S. DOT Fed Aviation Admin.  
Jamaica, NY

U.S. DOT Fed Aviation Admin.  
Atlantic City, NJ

U.S. DOT Fed Aviation Admin.  
Kansas City, MO

U.S. DOT Fed Aviation Admin.  
Valley Stream, LI, NY

U.S. DOT Fed Hwy. Admin.  
Sacramento, CA

U.S. DOT Library  
Washington, DC

U.S. DOT Urban Mass Trans. Admin.  
Atlanta, GA

U.S. Dept. of the Navy  
Virginia Beach, VA

U.S. Dept. of the Navy  
Monterey, CA

U.S. Dept. of the Navy  
Silver Spring, MD

U.S. Dept. of the Navy  
Corona, CA

U.S. Congress (Committee on  
Commerce Science Tech)  
Washington, DC

U.S. DOT Fed Aviation Admin.  
Anchorage, AK

U.S. DOT Fed Aviation Admin.  
Ft. Worth, TX

U.S. DOT Fed Aviation Admin.  
Los Angeles, CA

U.S. DOT Fed Aviation Admin  
Washington, DC

U.S. DOT Fed Hwy. Admin.  
Washington, DC

U.S. DOT Office of the Secretary  
Washington, DC

U.S. DOT Urban Mass Trans. Admin  
Washington, DC

U.S. Dept. of the Navy  
Washington, DC

U.S. Dept. of the Navy  
Bethesda, MD

U.S. Dept. of the Navy  
Orlando, FL

U.S. Dept. of the Navy  
Annapolis, MD

U.S. General Accounting Off.  
Washington, DC

U.S. DOT Fed Aviation Admin.  
Atlanta, GA

U.S. DOT Fed Aviation Admin.  
Honolulu, HI

U.S. DOT Fed Aviation Admin.  
Oklahoma City, OK

U.S. DOT Fed Hwy. Admin.  
Albany, NY

U.S. DOT Fed Railroad Admin.  
Fairfax, VA

U.S. DOT Trans. Systems Center  
Cambridge, MA

## 2. U.S. STATE AGENCIES

Alabama State Hwy. Dept. Montgomery, AL	Alaska Dept. of Highways Juneau, AK	Arizona DOT Phoenix, AZ
California DOT Sacramento, CA	Calif. Public Utilities San Francisco, CA	California State Library Sacramento, CA
Colorado Dept. of Highways Denver, CO	State of Conn. DOT Wethersfield, CT	Delaware DOT Dover, DE
Florida Dept. of Trans. Tallahassee, FL	Georgia Dept. of Trans. Forest Park, GA	Hawaii DOT Honolulu, HI
Idaho Transportation Dept. Boise, ID	Illinois DOT Chicago, IL	Illinois DOT Springfield, IL
Illinois DOT Oak Park, IL	Indiana St. Hwy. Commission Indianapolis, IN	Indiana State Library Indianapolis, IN
IOWA DOT Ames, IA	Kansas DOT Topeka, KS	Dept. of Economic Dev. Topeka, KS
Div. of St. Pl. and Res. Topeka, KS	Kentucky DOT Frankfort, KY	Louisiana St. DOT & Dev. Baton Rouge, LA
Maine DOT Augusta, ME	Maryland Dept. of St. Pl. Baltimore, MD	The Maryland Capitol Pl. Comm. Silver Spring, MD
Maryland DOT Baltimore-Washington Intn'l Airport, MD	Massachusetts Aeronautics Comm. East Boston, MA	Massachusetts Port Authority Boston, MA
The Commonwealth of Mass. Boston, MA	Massachusetts DPW Newton, MA	Michigan Aeronautics Comm. Lansing, MI
Minnesota DOT St. Paul, MN	Missouri St. Hwy. Dept. Jefferson City, MO	Nebraska DOT Lincoln, NE
Nevada DOT Carson City, NV	New Hampshire Dept. of Public Wks. Concord, NH	New Jersey DOT Trenton, NJ
New Mexico St. Hwy. Comm. Santa Fe, NM	New York State Library Albany, NY	New York St. DOT Albany, NY
N. Carolina DOT Raleigh, NC	N. Dakota St. Hwy. Dept. Bismarck, ND	Ohio DOT Columbus, OH
Oklahoma DOT Oklahoma City, OK	Oregon DOT Salem, OR	Pennsylvania DOT Harrisburg, PA
Puerto Rico Pl. Board Santurce, P.R.	DOT & Public Wks. Rapid Transit Area San Juan, P.R.	Rhode Island Dept. of Trans. Providence, RI
Tennessee DOT Nashville, TN	South Carolina Aero. Comm. South Carolina State Hwy. Dept. Columbia, SC	South Dakota DOT Pierre, SD
Texas Highway & DOT Austin, TX	Utah DOT Salt Lake City, UT	Vermont Dept. of Hwys. Montpelier, VT
Virginia Hwy. Trspt. Res. Council Charlottesville, VA	Washington Dept. of Hwys. Olympia, WA	W. Virginia Dept. of Hwys. Charleston, WV
Wisconsin DOT Madison, WI	Wyoming State Hwy. Dept. Cheyenne, WY	Dept. of Port Administration Pago Pago, American Samoa
Deputy Director Transportation/Communications Capitol Hill, Saipan, M.I.	Guam Airport Authority Tamuning, Guam	Mariana Islands A/P Authority Saipan, Mariana Islands
Mississippi State Hwy Dept. Jackson, MS		

### 3. U.S. REGIONAL AND LOCAL AGENCIES

Akron-Canton Reg. Airport North Canton, OH	Albany County Planning Board Albany, NY	Albany Capital Dist. Reg. Plan. Comm. Albany, NY
Albany Capital Dist. Transp. Auth. Albany, NY	Albany-Dougherty County Airport Albany, GA	Albuquerque Int'l Airport Albuquerque, NM
Allegheny County Dept. of Aviation Pittsburgh, PA	Allentown-Bethlehem-Easton Airport Allentown, PA	Anchorage Dept. of Trans. Anchorage, AK
Atlanta Planning Dept. Atlanta, GA	Atlanta Hartsfield Int'l Airport Atlanta, GA	Metro. Atlanta Rpd Transit Auth. Atlanta, GA
Baer Field Terminal Fort Wayne, IN	Baltimore Mass Transit Admin. Baltimore, MD	Baltimore Metro Transit Auth. Baltimore, MD
Baltimore Reg. Plng. Council Baltimore, MD	Bangor Int'l Airport Bangor, ME	BART Met. Trans. Comm. Berkeley, CA
Greater Baton Rouge Airport Baton Rouge, LA	Bay Area Rapid Transit Dist. Oakland, CA	Bi-State Development Agency St. Louis, MO
Bi-State Transit System St. Louis, MO	City of Birmingham, Aviation Dept. Birmingham, AL	Bl River St. Lawrence Reg. Plng. Bd. Canton, NY
Blue Grass Airport Lexington, KY	Boston Central Trspt Plng. Staff Boston, MA	Boston Trans. Plan Review Boston, MA
Broome County Commissioner of Plng. Binghamton, NY	Broome County Airport Binghamton, NY	Broome Co. Inv. Mgt. Council Binghamton, NY
Broome County Transit System Binghamton, NY	Broward County Aviation Div. Fort Lauderdale, FL	Burlington A/P Commission So. Burlington, VT
Cedar Rapids Municipal Airport Cedar Rapids, IA	Central Naugatuck Valley Reg. Pl. Ag. Waterbury, CT	Central Transportation Pl. Staff Boston, MA
Central New York Reg. Plng. & Dev. Syracuse, NY	Charleston Co. Aviation Auth. Charleston, SC	City of Charlotte, Airport Dept. Charlotte, NC
Charlotte-Mecklenburg Pl. Comm. Charlotte, NC	Chattanooga Municipal Airport Chattanooga, TN	Chicago Dept. of Aviation Chicago, IL
Chgo. Assn. Comm. & Industry Chicago, IL	Chicago Area Transportation Study Chicago, IL	Chicago Dept. of Public Works Chicago, IL
Chicago Reg. Transportation Auth. Chicago, IL	Chicago Transit Authority Chicago, IL	Clark County Dept. of Aviation Las Vegas, NV
Cleveland Hopkins Int'l Airport Cleveland, OH	Cleveland Transit System Cleveland, OH	Colorado Springs Municipal Airport Colorado Springs, CO
Columbia Regional Airport Columbia, MO	Columbia Region Assoc. of Govts. Portland, OR	Connecticut Reg. Plng Assoc. New Haven, CT
Dade County Aviation Dept. Miami, FL	Met. Dade County Transit Auth. Miami, FL	Dallas Aviation Dept. Dallas, TX
Dallas/Fort Worth Airport Dallas/Ft. Worth, TX	Dayton Municipal Airport Vandalia, OH	Daytona Beach Regional Airport Daytona Beach, FL
Delaware Valley Rgl. Pl. Comm. Philadelphia, PA	Denver Council of Govt. Denver, CO	Denver Metro Transit Denver, CO
Denver Reg. Council of Govts. Denver, CO	Denver Reg. Transportation Dist. Denver, CO	Des Moines Municipal Airport Des Moines, IA
Detroit Bd. of County Rd. Comms. Detroit, MI	East-West Gateway Coord. Council St. Louis, MO	El Paso Int'l Airport & Mass Trans Bd. El Paso, TX
Eppley Airfield Omaha, NE	Erie County Mental Health Svc Buffalo, NY	Erie Niagara Cties Reg. Pl. Bd. Grand Island, NY
City of Flint Dept. of Aeronautics Flint, MI	Fresno Trans. Dept., Airports Div. Fresno, CA	General Mitchell Field Milwaukee, WI
Genessee Finger Lakes Reg. Pl. Bd. Rochester, NY	Genessee Trspt Study Rochester, NY	Great Lakes Basin Comm. Ann Arbor, MI
Greater Hartford Transit Dist. Hartford, CT	Greenville-Spartanburg Airport Greer, SC	T.F. Green State Airport Warwick, RI
Greensboro-High Point Airport Greensboro, NC	Health & Welfare Council of Cent. Md. Baltimore, MD	Hillsborough Cty Aviation Auth. Tampa, FL

### 3. U.S. REGIONAL AND LOCAL AGENCIES (Continued)

Houston Intercontinental Airport Houston, TX	Indianapolis Airport Authority Indianapolis, IN	Ithaca Dept. of Public Works Ithaca, NY
Jackson Municipal Airport Auth Jackson, MI	Jacksonville Port Authority Jacksonville, FL	Jefferson City Memorial Airport Jefferson City, MO
Joplin Municipal Airport Joplin, MO	Kalamazoo Municipal Airport Kalamazoo, MI	Kansas City Aviation Dept. Kansas City, MO
Kent County Aeronautics Board Grand Rapids, MI	Kenton County Airport Board Cincinnati, OH	Kentuckiana Reg. Pl. & Dev. Agency Louisville, KY
Kern County Dept. of Airports Bakersfield, CA	King County Airport-Boeing Field Seattle, WA	City of Knoxville, Dept. of Airports Knoxville, TN
Lafayette Airports Comm. Lafayette, LA	Lake Charles Municipal Airport Lake Charles, LA	Lee County Airport Fort Meyers, FL
Lewiston Volunteer Trspt Program Lewiston, ME	Lincoln Municipal Airport Lincoln, NE	Lockheed Air Terminal, Inc. Burbank, CA
Long Beach Public Trans. Co. Long Beach, CA	Los Angeles Dept of Airports Los Angeles, CA	Louisville & Jefferson County Air Bd. Louisville, KY
Manchester Municipal Airport Manchester, NH	Maryland RPC Silver Springs, MD	Maryland State Aviation Admin. Balti-Wash. Int'l Airport, MD
Mason City Municipal Airport Mason City, IA	Melbourne Regional Airport Melbourne, FL	Memphis International Airport Memphis, TN
Mercer County Airport W. Trenton, NJ	Mid-Ohio Reg. Plng. Comm Columbus, OH	Middlesex Co. Planning Board New Brunswick, NJ
Metro Transit Commission Minneapolis, MN	Minneapolis-St. Paul Airports Comm. Minneapolis, MN	Montgomery County Dept. of Pl & Dev. Fonda, NY
Montgomery County DOT Rockville, MD	Mueller Municipal Airport Austin, TX	Muskegon County Airport Muskegon, MI
Metro Nashville Airport Auth Nashville, TN	Nassau Cnty Dept. of Transpt. Mineola, NY	Nat'l Rgl. Pl & Dev. Comm Towanda, PA
Natrona County Int'l Airport Casper, WY	New Orleans Int'l Airport New Orleans, LA	New Orleans Public Service Inc New Orleans, LA
Metro Transportation Auth New York, NY	NYC Transportation Admin. New York, NY	New York City Trans. Authority New York, NY
N Y Regional Planning Assoc. New York, NY	Niagara Frontier Port Authority Buffalo, NY	Niagara Tariff Bureau Buffalo, NY
Norfolk Port & Indust. Authority Norfolk, VA	North Central Texas COG Arlington, TX	N.E. Ohio Oceanside Coord. Agency Cleveland, OH
North Platte Airport Auth. North Platte, NE	Oklahoma City A. P. Oklahoma City, OK	Orange County Airport Santa Ana, CA
Greater Orlando Aviation Auth. Orlando, FL	Oxnard Dept. of Airport & Harbors Oxnard, CA	Paducah Airport Corp. Paducah, KY
Palm Beach Int'l Airport W. Palm Beach, FL	City of Palm Springs Transpt. & Opr. Palm Springs, CA	Patrick Henry Airport Newport News, VA
Capital City Airport New Cumberland, PA	City of Pensacola Airport Pensacola, FL	Greater Peoria Airport Auth. Peoria, IL
Philadelphia Int'l Airport Philadelphia, PA	City of Phoenix Aviation Dept. Phoenix, AZ	Pittsburgh Port Auth. Transit Pittsburgh, PA
Port Auth. of NY & NJ New York, NY	Port Auth. of NY & NJ Jersey City, NJ	Port of New York Authority Pittsburgh, PA
Port Columbus Int'l Airport Columbus, OH	Port of Oakland Oakland, CA	Port of Palm Beach Riviera Beach, FL
Port of Portland Portland, OR	Portland Int'l Jetport Portland, ME	Pueblo Memorial Airport Pueblo, CO
Quad City Airport Moline, IL	Regional Planning Council Winter Park, FL	Reno Int'l Airport Reno, NV



### 3. U.S. REGIONAL AND LOCAL AGENCIES (Continued)

Richland-Lexington Airport Dist. Columbia, SC	Rochester-Genesee Reg. Trans. Auth. Rochester, NY	Regional Transit Service East Rochester, NY
Greater Rockford Airport Auth. Rockford, IL	Sacramento County Dept. of Airports Sacramento, CA	St. Joseph County Airport Auth. South Bend, IN
St. Louis Metro Area Airport Auth. Edwardsville, IL	St. Louis Airport Authority St. Louis, MO	Salt Lake City Int'l Airport Salt Lake City, UT
City of San Antonio Aviation Dept. San Antonio, TX	San Antonio Transit System San Antonio, TX	San Diego Unified Port Dist. San Diego, CA
San Francisco Int'l. Airport San Francisco, CA	City of San Jose Aviation Dept. San Jose, CA	Sarasota-Bradenton Airport Sarasota, FL
Saratoga Research & Dev. Center Ballston Spa, NY	Savannah Airport Comm. Savannah, GA	Schenectady County Pl. Dept. Schenectady, NY
Schoharie County AG Div. Cobleskill, NY	Sea-Tac Int'l Airport Seattle, WA	Southeast Michigan COG Detroit, MI
Southeast Mich. Trans. Authority Detroit, MI	Southern Calif. Rapid Transit Dist. Los Angeles, CA	Southern Tier Central Reg Pl. Bd Corning, NY
Southwestern Penn Reg. Pln. Comm. Pittsburgh, PA	Spokane Int'l Airport Spokane, WA	Springfield Airport Auth. Springfield, IL
Springfield Municipal Airport Springfield, MO	Stapleton Int'l Airport Denver, CO	Stockton Metro. Airport Stockton, CA
City of Syracuse Aviation Comm. Syracuse, NY	Tennessee Valley Dev. District Johnson City, TN	No. Cen. Texas Council of Govts. Arlington, Tx
Toledo-Lucas Cty Port Auth. Toledo, OH	Transportation Coord. Comm. Dayton, OH	Tri-City Airport Comm/ Freeland, MI
Tri-County Council for Southern Md. Waldorf, Md	Tri Cnty. Metro. Transportation Dist. of Oregon Portland, OR	Tri-State Airport Huntington, WV
Tri State Reg. Pl. Comm. New York, NY	Tri-State Trans. Comm. New York, NY	City of Tucson DOT Tucson, AZ
Public Transp. Div. Tucson Tucson, AZ	Tulsa Airport Authority Tulsa, OK	Twin Cities Area Met. T. Com St. Paul, MN
Urban Travel Demand Forecasting Proj. Berkeley, CA	Volusia Council of Gvts Daytona Beach, CA	Wasatch Front Reg. Council Bountiful, UT
Metro. Washington Airports Washington, DC	Metro Washington Council of Gvts. Washington, DC	Wash. Metro Area Transit Comm. Washington, DC
The Wichita Airport Authority Wichita, KS	Will Rogers World Airport Oklahoma City, OK	Winston Salem City County Pl. Bd. Winston Salem, NC
Youngstown Municipal Airport Youngstown, OH		

#### 4. U.S. BUSINESSES, INDUSTRIES, AND ASSOCIATIONS

Aluminum Co. of America Pittsburgh, PA	American Commercial Lines Houston, TX	American Ex. Isbrandtsen Lines New York, NY
American Greetings Corp. Cleveland, OH	American Home Products New York, NY	American Ry. Car Inst. New York, NY
American Trucking Assns. Washington, DC	Andrews Moving & Storage Cleveland, OH	Applied Resource Integration Ltd. Schenectady, NY
Arkansas Best Corp. Fort Smith, AR	Armco Steel Corp. Middletown, OH	Arsham & Keenan New York, NY
Assn. of American R.R. Washington, DC	Assoc. India Pak Conf. New York, NY	Assoc. of S.E. R.R. Washington, DC
Assoc. of Western Rys. Chicago, IL	Atchison, Topeka & Santa Fe Chicago, IL	Athearn & Co. Oakland, CA
AAI Corp. Baltimore, MD	ABT Associates Cambridge, MA	A C Transit Oakland, CA
ACI Systems Corp. Northfield, IL	AMTRAK Washington, DC	APL Services, Inc. Trenton, NJ
ARA, Inc. West Covina, CA	ATE MGT & Service Co., Inc. Cincinnati, OH	A-T-O Inc. Huntington Station, NY
AT&T Longlines New York, NY	Adams & Peck New York, NY	Advanced Transportation Mgt., Inc. Washington, DC
Advertising & Marketing Research Burbank, CA	Aero Data Inc. Syosset, NY	Aero-Engineering Inglewood, CA
Aerojet-General Corp. Sacramento, CA	Aerojet-General Corp. Azusa, CA	Aerophysics, Co. Washington, DC
Aerophysics Research Corp. Bellevue, WA	The Aerospace Corporation Los Angeles, CA	Aerospace Industries Association Washington, DC
Aerospace Systems Inc. Burlington, MA	Air Research Manufacturing Co. Phoenix, AZ	Air Transport Association Washington, DC
Air Transport Association Fort Worth, TX	Air Vehicle Corp. San Diego, CA	A. T. & F. Railway Amarillo, TX
Air Trans. Assn. of America Washington, DC	Airbus Industrie of N. America New York, NY	Aircraft Owners & Pilots Assn. Washington, DC
Airways Engineering Corp. Washington, DC	Alaska Airlines, Inc. Seattle, WA	Com-Serv Albuquerque, NM
Allegheny Airlines Washington, DC	Aloha Airlines, Inc. Honolulu, HI	American Airlines, Inc. New York, NY
American Airlines, Inc. Flushing, NY	American Express Co. New York, NY	American General Capital Management, Inc. Houston, TX
Alex Brown & Sons Baltimore, MD	American Paper Institute New York, NY	American Power Jet Co. Ridgefield, NJ
American Science & Eng. Inc. Cambridge, MA	American Security Bank Washington, DC	American Telephone & Telegraph Co. Morristown, NJ
American Trucking Association Washington, DC	Anchor Corp. Elizabeth, NJ	Applied Resources Integration Ltd. Schenectady, NJ
Applied Resource Integration Boston, MA	Arkwin Industries Inc. Westbury, NY	Arnold & Porter Washington, DC
ARTECH Corp. Falls Church, VA	Associated Truck Lines Grand Rapids, MI	Atlantic Research Corp. Alexandria, VA
N.W. Ayre & Sons, Inc. New York, NY	B.I.C. Cons. Co. Ltd. Schiller Park, IL	BN Transport, Inc. Galesburg, IL
American Assoc. of State Hwy & Trans. Officials Washington, DC		

#### 4. U.S. BUSINESSES, INDUSTRIES, AND ASSOCIATIONS (Continued)

Babson's Reports, Inc. Wellesley Hills, MA	Bacon, Whipple & Co. New York, NY	Bailey and Broder New York, NY
Michael Baker, Inc. Beaver, PA	Baltimore & Ohio R.R. Baltimore, MD	Bank of America San Francisco, CA
Bank of America Chicago, IL	The Bank of California San Francisco, CA	Bank of New York New York, NY
Bankers Trust Co. New York, NY	Barron's, Inc. New York, NY	Harlen Bartholomew & Assoc. Washington, DC
Barton-Aschman Assoc. San Jose, CA	Battelle Columbus Laboratories Columbus, OH	Beauvais, Roberts and Assoc. Washington, DC
Bechtel Corp. San Francisco, CA	Becker Securities Corporation Chicago, IL	Beckman Instruments, Inc. Fullerton, CA
Becton Dickinson & Co. Resrch Tri Pk, NC	Beech Aircraft Corp. Wichita, KS	Belfour Stulen, Inc. Traverse City, MI
Bell Helicopter Co. Ft. Worth, TX	Beltran Associates Inc. Brooklyn, NY	Bender & Loudon Freight W. Richfield, OH
Bendix Corp Ft. Lauderdale, FL	Bendix Corp. Davenport, IA	Bendix Corp. Teterboro, NJ
Bessemer & Lake Erie R.R. Pittsburgh, PA	Bigelow Crain Assoc. Menlo Park, CA	Biosciences Information Service Philadelphia, PA
Blyth Eastman Dillon & Co, Inc. New York, NY	Boeing Comm. Airplane Co. Seattle, WA	Bodell & Company Providence, RI
Boeing Co. Philadelphia, PA	Booz, Allen & Hamilton New York, NY	Booz-Allen Bethesda, MD
Borg-Warner Corp. York, PA	The Boston Consulting Group Boston, MA	Boston & Maine R.R. Boston, MA
Boston & Taunton Trans. Co. Boston, MA	Bowater Sales Co. New York, NY	Bourns, Inc. Barrington, IL
Braniff International Dallas, TX	British Aircraft Corp. Arlington, VA	British Airways New York, NY
Brooks & Perkins Westfield, MI	Brown Bros. Harriman & Co. New York, NY	Browne & Assoc. Staten Island, NY
Brundage, Story, Rose New York, NY	Bucher & Willis Salina, KS	James C. Buckley, Inc. Washington, DC
Burlington Industries Burlington, NC	Burlington Northern, Inc. St. Paul, MN	W. E. Burnet & Co. New York, NY
Burnham & Co. New York, NY	Burns & Roe Inc. Oradell, NJ	Byrd Tallamy MacDonald & LWS Falls Church, VA
C&O-B&O Railroad Baltimore, MD	Cahn Engineers, Inc. Wallingford, CT	CCI Corp. Van Nuys, CA
C&NW Railway Chicago, IL	California Business Los Angeles, CA	California Bus. & Trans. Agy. Sacramento, CA
Cal. Pacific Utilities Co. San Francisco, CA	California Trucking Assn. Burlingame, CA	Calspan Corp. Buffalo, NY
Calvin Bullock, Ltd. New York, NY	Cambridge Systematics Cambridge, MA	Capitoline Investment Services, Inc. Richmond, VA
Cargill, Inc. Minneapolis, MN	Carnegie Library of Pittsburgh Pittsburgh, PA	Carpool Portland, OR
Caterpillar Tractor Co. Peoria, IL	Cessna Aircraft Co. Wichita, KS	Chamberlain Manufacturing Corp. Waterloo, IA
Champlain Technology, Inc. W. Palm Bch, FL	Charles River Associates, Inc. Cambridge, MA	Charles Stark Draper Laboratory, Inc Cambridge, MA

#### 4. U.S. BUSINESSES, INDUSTRIES, AND ASSOCIATIONS (Continued)

Chase Rosen and Wallace Inc. Alexandria, VA	Central Trust Company Cincinnati, OH	Chase Manhattan Bank New York, NY
Chrysler Corp. Detroit, MI	Ciba-Geigy Corp. Ardsley, NY	Citizens For Clean Air New York, NY
The Citizens & Southern National Bank Atlanta, GA	Clark, Dodge & Co. New York, NY	Club Aluminum Products Cleveland, OH
The Coca-Cola Co. Atlanta, GA	Cohn, Delaire & Kaufman, Inc. New York, NY	Colin, Hochstin Company Southport, CT
S.S. Colker & Associates, Inc. Washington, DC	Collins and Aikman Corp. New York, NY	Commercial Traffic Co. Cleveland, OH
Common Cause Washington, DC	Communications Satellite Corp. COMSAT Labs. Clarksburg, MD	The Computer Co. Richmond, VA
Computer Identics Corp. Westwood, MA	Computer Sciences Corp. Silver Spring, MD	Computran Systems Corp. Hackensack, NJ
COMSIS Corp. Wheaton, MD	CONSAD Resc. Corp. Pittsburgh, PA	Consolidated Controls Corp. Bethel, CT
Consolidated Freightways Menlo Park, CA	Consolidated Rail Corp. Cleveland, OH	Consolidation Coal Co. Pittsburgh, PA
Containerization Inst. New York, NY	Continental Airlines, Inc. Los Angeles, CA	Continental Bank Chicago, IL
Continental Electronics Mfg. Co. Dallas, TX	Continental Ins. Co. New York, NY	Control Data Corp. Minneapolis, MN
Cooper-Jarrett, Inc. Orange, NJ	Corrdry Carpenter Dietz & Zack Harrisburg, PA	Coverdale & Colpitts, Inc. New York, NY
Crain and Associates Sacramento, CA	Creare, Inc. Hanover, NH	Creighton Hamburg & Associates Bethesda, MD
Creighton Hamburg Delmar, NY	Crocker Citizens Natl. Bank San Francisco, CA	Crocker National Corporation San Francisco, CA
Curtiss-Wright Corp. Wood-Ridge, NJ	Cyrus J. Lawrence, Inc. New York, NY	DACP, Inc. Boston, MA
DTM, Inc. Bethesda, MD	Dalton Dalton Little Newport Cleveland, OH	Data Resource Center Lexington, MA
Dave Systems, Inc. Beverly Hills, CA	Davis Skaggs & Company San Francisco, CA	DeHaven & Townsend, Crouter & Bodine Philadelphia, PA
DeLeon Research Assoc. Lake Hiawatha, NJ	DeLeuw Cather & Company Washington, DC	DeLeuw, Cather & Co. Chicago, IL
DeLeuw, Cather and Co. San Francisco, CA	L. M. Dearing Assoc., Inc. Studio City, CA	Decision Sciences Corp. Jenkintown, PA
Defense-Aerospace Mkt. Intelligence Greenwich, CT	DeLafield Childs, Inc. New York, NY	Delta Air Lines, Inc. Atlanta, GA
Digital Analysis Consultants, Inc. La Jolla, CA	Dillon, Gordon, Hawkey & Shortt New York, NY	Dist. & Trans. Res. Co. Columbus, OH
DODCO Inc. Blawenburg, NJ	Donaldson Lufkin & Genrette, Inc. New York, NY	Douglas Aircraft Co. Long Beach, CA
Drake, Sheahan, S. Dougall New York, NY	Duff and Phelps, Inc. Chicago, IL	E I Du Pont de Nemours & Co. Wilmington, DE
E-Systems Inc. Greenville, TX	ELDEC Corp. Lynnwood, WA	East Motor Carriers Assn. Akron, OH
Eastern Air Lines, Inc. Washington, DC	Eastern Air Lines, Inc. Miami, FL	Eastman Kodak Co. Rochester, NY
Easton Corp. Southfield, MI	F. Eberstadt & Company, Inc. New York, NY	The Economic Sciences Corp. Washington, DC
Ecosometrics, Inc. Bethesda, MD	Eli Bridge Co. Jacksonville, IL	Engineering Computer Intern'l Cambridge, MA



#### 4. U.S. BUSINESSES, INDUSTRIES, AND ASSOCIATIONS (Continued)

Environmental Consultants, Inc. Dallas, TX	Env. Res. & Tech. Inc. Lexington, MA	Equibank Pittsburgh, PA
The Equitable Life Assurance Society of the United States New York, NY	Erie, Lackawanna Ry. Cleveland, OH	Ernst & Ernst Washington, DC
European American Bank New York, NY	Evans Products Co. Des Plaines, IL	The Exchange Farmington, CT
Exchange Bibliographies Monticello, IL	Experimental Aircraft Assn. Hales Corners, WI	Exploratory Proj F Econo Alt. Washington, DC
Export-Import Bank of the US Washington, DC	Fairchild Hiller Corp. Hagerstown, MD	Fairchild Industries Farmingdale, NY
Fairchild Publications, Inc. New York, NY	Farrell Lines, Inc. New York, NY	Fasson Painesville, OH
Faulkner, Delkham & Sullivan New York, NY	Fay, Spoffard, Thorndike, Inc. Boston, MA	Federal Express Memphis, TN
Federal Reserve Bank of Cleveland Cleveland, OH	Federal Reserve Bank of New York New York, NY	Federal Reserve Bank of Philadelphia Philadelphia, PA
Federal Reserve Bank of San Francisco San Francisco, CA	Fern Engineering Co., Inc. Buzzards Bay, MA	Fetske Boat Works Essex, CT
Fidelity Management & Res. Co. Boston, MA	The Financial Analysts Federation New York, NY	First Greenwich Co. Greenwich, CT
The First Boston Corp. New York, NY	First City Nat'l Bank of Houston Houston, TX	First Manhattan Company New York, NY
First & Merchants Nat'l Bank Richmond, VA	The First Nat'l Bank of Atlanta Atlanta, GA	National City Bank New York, NY
The First Pennsylvania Banking and Trust Co. Philadelphia, PA	Flight Trans Assoc., Inc. Burlington, MA	Fluidyne Eng Corp. Minneapolis, MN
Flying Tiger Line, Inc. Los Angeles, CA	Ford Aerospace & Comm. Corp. Palo Alto, CA	Ford Aerospace & Comm. Corp. Newport Beach, CA
Ford, Bacon & Davis New York, NY	Ford Motor Co. Dearborn, MI	Forte, Inc. Alexandria, VA
Foster Assn. Washington, DC	J.J. Friedman & Assoc. Washington, DC	Frontier Airlines, Inc. Denver, CO
GFA Engineering Systems Baltimore, MD	Garrett Corp. Torrance, CA	GATX Corp. Niles, IL
Gellman Associates Jenkintown, PA	Gen. Amer. Trans. Corp. Chicago, IL	General Dynamics Corp. San Diego, CA
General Dynamics/Convair Washington, DC	General Electric Co. Cincinnati, OH	General Electric Co. Philadelphia, PA
General Electric Lynn, MA	General Electric Co. Syracuse, NY	General Electric Co. Schenectady, NY
General Electric Co. Utica, NY	General Electric Credit Corp. Stanford, CT	General Foods Corp. White Plains, NY
General Motors Corp. Goleta, CA	General Motors Corp. Detroit, MI	General Motors Tech. Ctr. Warren, MI
General Ry. Signal Co. New York, NY	General Research Corp. Santa Barbara, CA	Georgia Pacific Corp. Portland, OR
Georgeson & Co. New York, NY	Giannotti Associates Bellport, NY	Glen A. Gilbert & Assoc. Washington, DC
Gofen & Glossberg Chicago, IL	W. A. Golomski & Assoc. Chicago, IL	Goodkind Odea Inc. Clifton, NJ
Gotch and Crawford Damascus, MD	Grand Trunk Western R.R. Detroit, MI	Greenwich Data System Greenwich, CT
Griffin Wheel Co. Chicago, IL	Grocery Mfrs. of America Washington, DC	G. S. Grumann & Associates Boston, MA

#### 4. U.S. BUSINESSES, INDUSTRIES, AND ASSOCIATIONS (Continued)

Hough Laboratory Springfield, OH	Hoppin Watson, Inc. New York, NY	Nat'l Assoc. of State Aviation Offls. Washington, DC
Grumman Aerospace Corp. Bethpage, NY	Gulf Research & Dev. Co. Pittsburgh, PA	Morris Guralnick Assoc., Inc. San Francisco, CA
Haig-K-Aircraft Corp. Malvern, PA	Hanover Trust Company New York, NY	Harbor Sales Co., Inc. Baltimore, MD
Harbridge House Washington, DC	Harbridge House Boston, MA	Harris-Intertype Corp. Syosset, NY
Harris Trust & Savings Bank Chicago, IL	Harris, Upham & Co. Boston, MA	Fred Hart Assoc., Inc. New York, NY
Hartford Fire Ins. Co. Hartford, CT	The Hartford Ins. Group Hartford, CT	Haskins & Sells Miami, FL
Hawaiian Airlines, Inc. Honolulu, HI	Heine & Co. New York, NY	H.J. Heinz Co. Pittsburgh, PA
Hercules, Inc. Magna, UT	High Speed Ground Trans. Journal Durham, NC	Honeywell, Inc. St. Petersburg, FL
Honeywell, Inc. Hopkins, MN	Howard, Needles, Tammen & Bergendoff Alexandria, VA	Howard, Needles, Tammen & Bergendoff New York, NY
B. Howlett, Inc. Brewster, NY	W. L. Huffard Assoc. Salt Lake City, UT	Hughes Aircraft Co. Fullerton, VA
Hughes Aircraft Co. Culver City, CA	Hughes Aircraft Co. Los Angeles, CA	Hughes Airwest San Francisco, CA
Human Science Research Inc. McLean, VA	Humble Oil & Refining Houston, TX	Humes-Schmidlapp Assoc. New York, NY
Hunt-Wesson Foods, Inc. Fullerton, CA	Wm. Hutchinson & Co., Inc. San Francisco, CA	E. F. Hutton & Co., Inc. Denver, CO
Hyster Company Field Sales Office Oak Brook, IL	IAC/Loral Corp. Bronx, NY	ISI Corporation San Francisco, CA
IML Freight, Inc. Salt Lake City, UT	I.P.T. New York, NY	IPA Washington, DC
Illinois Central R.R. Chicago, IL	The Indiana Nat'l Bank Indianapolis, IN	Inter-Controls Inc. Washington, DC
International Business Machines Corp. Owego, NY	I.B.M. Cambridge, MA	International Harvester Chicago, IL
Intl. Logistics Co. N. Olmsted, OH	Intl. Minerals & Chemical Skokie, IL	Intl. Minerals & Chemical Libertyville, IL
International Paper Co. New York, NY	Intern'l Utilities Corp. Philadelphia, PA	Investment Bankers Assoc. of America Silver Spring, MD
Investment Dealers Digest New York, NY	Irving Trust Company New York, NY	JHK & Associates Titusville, FL
Jack Faucet & Assoc. Chevy Chase, MD	Jack Faucett Assoc. Silver Spring, MD	Jet Propulsion Laboratory Pasadena, CA
David L. Johnson and Assoc., Inc. Vashon, WA	John Hancock Mutual Life Insurance Company Boston, MA	The Journal of Commerce New York, NY
Kaman Aerospace Corp. Bloomfield, CT	Kaman Sciences Corp. Burlington, MA	Kaman Sciences Corp. Colorado Spgs, CO
A.T. Kearney & Co., Inc. Chicago, IL	Kidder, Peabody, Inc. New York, NY	H. Kimbriel & Assoc. New York, NY
Knickerbocker News Albany, NY	Kraft Foods Chicago, IL	Kuhn, Loeb and Co. New York, NY
LFE Corp. Waltham, MA	NFTC Buffalo, NY	Lea Transportation Research Huntsville, AL
LTV Aerospace Corp. E-Systems Inc. Dallas, TX	Lamson Bros. & Co. Chicago, IL	Lane Magazine & Book Company Menlo Park, CA
Leeds & Lippincott Co. Atlantic City, NJ	Leesona Corp. Warwick, RI	Legg, Mason & Company Baltimore, MD
Lehman Brothers, Inc. New York, NY	The Lehman Management Co. New York, NY	Generl. Elect. Co. Erie, PA
LEX Systems Inc. Menlo Pk, CA	LEX/Tran. Soc. Santa Clara, CA	Liberty Mutual Ins. Co. Boston, MA

#### 4. U.S. BUSINESSES, INDUSTRIES, AND ASSOCIATIONS (Continued)

Lighting & Transients Res. Inc. St. Paul, MN	Lincoln Electric Co. Cleveland, OH	Linda Hall Library Kansas City, MO
Thomas J. Lipton Inc. Englewood Cliff, NJ	A. D. Little, Inc. Cambridge, MA	Lockheed Aircraft Corp. Lockheed Missiles & Space Co., Inc. Sunnyvale, CA
Lockheed-California Co. Burbank, CA	Lockheed-California Co. Burbank, CA	Lockheed-Georgia Co. Marietta, GA
Loeb, Rhoades and Co. New York, NY	Logicon, Inc. San Pedro, CA	Long Island R.R. Jamaica, L.I., NY
Louis T. Klauder & Assoc. Philadelphia, PA	Lykes Bros. Steamship Co. New Orleans, LA	MZF Associates Los Angeles, CA
Machovia Bank and Trust Co. Winston-Salem, NC	Mackay-Shields Economics, Inc. New York, NY	Macro Systems, Inc. Silver Springs, MD
Management Enterprises, Inc. Oklahoma City, OK	Management Enterprises Corona Del Mar, CA	Management Science Assoc. Pittsburgh, PA
Manufactures Hanover Trust New York, NY	Manufactures Hanover Trust Co. New York, NY	Marine Midland Trust Co. New York, NY
Market Facts Inc. Chicago, IL	Magnaflux Corp. Chicago, IL	Magnavox Co. Torrance, CA
Maine Central R.R. Portland, ME	Martin Marietta Corp. New York, NY	Martin Marietta Corp. Denver, CO
Martin Marietta Corp. Orlando, FL	Marttila Payne & Assoc. Boston, MA	Marsh & McLennan New York, NY
Massachusetts Mutual Life Ins. Co. Springfield, MA	McDonnell Douglas Corp. St. Louis, MO	McDonnell Douglas Corp. Huntington Bch, CA
McDD-Douglas Fin. Corp. Long Beach, CA	Arthur McKee & Co. Cleveland, OH	McKinsey & Co., Inc. New York, NY
A.L. Mechling Barge Lines Joliet, IL	Medical Research Eng. Great Notch, NJ	Merill Lynch, Pierce, Fenner & Smith, Inc. New York, NY
Metropolitan Life Ins., Co. New York, NY	Micro Craft Inc. Tullahoma, TN	Mid-Hudson for Progress, Inc. Poughkeepsie, NY
Middle Atlantic Conf. Washington, DC	Midland-Ross Corp. Cleveland, OH	Midwest Research Inst. Kansas City, MO
The Milwaukee Road Chicago, IL	Minnesota Mining & Mfg Co. St. Paul, MN	Mitchell, Hutchins, Inc. New York, NY
Mitchell & Co. Washington, DC	Mitre Corp. McLean, VA	Mobil Oil Corp. New York, NY
Modern Railroads Washington, DC	Modern Railroads Chicago, IL	Moody's Investors Service, Inc. New York, NY
Moore & Schley, Cameron & Co. New York, NY	Morgan Stanley & Co. New York, NY	Moseley, Hallgarten & Estabrook, Inc. Boston, MA
Motor Veh Mfg Assoc. Detroit, MI	Muller & Company New York, NY	Multisystems, Inc. Cambridge, MA
The Mutual Benefit Life Insurance Co. Newark, NJ	Mutual of Omaha Omaha, NB	NTSB Washington, DC
Morgan Guaranty Trust Co. New York, NY	National Airlines, Inc. Miami, FL	National Air & Space Museum Washington, DC
Nat'l Assoc. of Corrosion Eng. W Loop South	Oregon St. DOT Salem, PR	National Aviation Corporation New York, NY
Nat'l Bank of Detroit Detroit, MI	Nat'l Distillers & Chem. New York, NY	National Economic Research Assoc. Washington, DC
Nat'l City Mgt Co. Fairfax, VA	Nat'l Fire Protection Assoc. Boston, MA	Nat'l Railway Publ. Co. New York, NY
Natl. R.R. Passenger Corp. Washington, DC	National Securities & Res Corp. New York, NY	Natl. Starch & Chem. Corp. New York, NY
Nat'l Transit Newsletter Upper Marlboro, MD	New England Merchants Nat'l Bank Boston, MA	James P. Purcell Assoc. East Orange, NJ
New York, Council Economic Education New York, NY	New York Airways Flushing, NY	N.Y. Life Ins. Co. New York, NY



#### 4. U.S. BUSINESSES, INDUSTRIES, AND ASSOCIATIONS (Continued)

Newport News Shipbuilding & Dry Dock Co. Newport News, VA	Nielsen Eng. & Res. Inc. Mountain View, CA	NOACA Cleveland, OH
Nolan/Johnston, Inc. Tarrytown, NY	Norfolk & Western Ry. Roanoke, VA	North American Car Corp. New York, NY
North Central Airlines, Inc. Minneapolis, MN	Northern Trust Co. Chicago, IL	Northrop Corp. Hawthorne, CA
Northrop Corp. Arlington, VA	Northrop Corp. Rolling Mds, IL	Northrop Corp. Norwood, MA
Northrop Inst. of Tech. Inglewood, CA	Northwest Airlines, Inc. St. Paul, MN	Northwest Sub. Mass Transit Bartlett, IL
Novo Intern'l Air Freight Corp. San Francisco, CA	Ogilvy & Mather Adv. Co. New York, NY	James H. Oliphant & Co. New York, NY
OMNICOM, Inc. McLean, VA	Operations Research, Inc. Silver Spring, MD	Opinion Res. Assoc. Madison, WI
Opinion Res. Corp. Princeton, NJ	Oppenheimer & Company New York, NY	Otis Elevator Co. Mahwah, NJ
Ozark Air Lines, Inc. Washington, DC	Ozark Air Lines, Inc. St. Louis, MO	PR Associates New York, NY
PRC Computer Center, Inc. McLean, VA	Paceco Alameda, CA	Paine, Webber, Jackson & Curtis New York, NY
Pan Am World Airways New York, NY	Pan American World Airways Jamaica Plain, NY	Palomar College San Marcos, CA
Parsons Brinckerhoff Etc. New York, NY	L.E. Peabody & Assoc. Lanham, MD	Peat, Marwick, Mitchell & Co. Washington, DC
Peat, Marwick, Mitchel and Co. San Francisco, CA	Penn Central New York, NY	Penn Central Co. Philadelphia, PA
The Penn Group, Inc. Bala Cynwyd, PA	Perkin-Elmer Corp. Norwalk, CT	Pershing and Company New York, NY
Charles Pfizer & Co. New York, NY	Phillip P. Baratz, Assoc. New York, NY	Piedmont Advisory Corp. Stamford, CT
Piedmont Aviation, Inc. Winston-Salem, NC	Piper Aircraft Corp. Lock Haven, PA	Piper Aircraft Corp. Vero Beach, FL
Planning Research Corp. McLean, VA	Pollution Engineering Technical Publishing Co. Greenwich, CT	Port Authority Transit Corp. Camden, NJ
Pratt and Assoc. Kensington, MD	Pratt and Whitney Aircraft East Hartford, CT	Professional Economics, Inc. Boston, MA
Prototype Development Assoc., Inc. Santa Ana, CA	The Provident Nat'l Bank Philadelphia, PA	Public Service Comm. Bismarck, ND
Pullman, Inc. Chicago, IL	Quantics, Inc. West Chester, PA	RCA Corp. Moorestown, NJ
RRC Intern'l, Inc. Latham, NY	Rwy. Labor Exec. Assn. Washington, DC	The Rand Corp. Santa Monica, CA
Rea, Cross & Knebel Washington, DC	Reading Co. Philadelphia, PA	Robert Reebie & Assoc. Greenwich, CT
Reg. Common Carrier Conf. Washington, DC	Republic Nat'l Bank of Dallas Dallas, TX	Reserve Terminals Co. Cleveland, OH
Resource Mgmt. Corp. Bethesda, MD	Resource Pl. Assc. Inc. Vienna, VA	Resource Planning Assoc. Cambridge, MA
Rinfret, Boston Assoc. New York, NY	Rio Grande Western R.R. Denver, CO	Roadway Express, Inc. Akron, OH
Robinson, Humphrey & Co. Atlanta, GA	Rock Island Lines Chicago, IL	Rockwell Intern'l Corp. Columbus, OH
Rockwell Intern'l Corp. McGregor, TX	Rockwell Intern'l Corp. Downey, CA	Rockwell Intern'l Corp. Anaheim, CA
Rockwell Intern'l Corp. Canoga Pk, CA	Rockwell Intern'l Corp. Los Angeles, CA	Rollis-Royce New York, NY



#### 4. U.S. BUSINESSES, INDUSTRIES, AND ASSOCIATIONS (Continued)

Wm. C. Roney & Co. Detroit, MI	Rosemount Inc. Eden Prairie, MN	Howard R. Ross Assoc. Englewood, CO
Peter Ross and Co. New York, NY	Rotar, Mosle-Dallas Union Houston, TX	Roth, Gerard & Co. New York, NY
SAR-ASIST-INC Greenwich, CT	St. Regis Paper Co. New York, NY	Salomon Brothers Chicago, IL
Salomon Brothers New York, NY	San Diego Transit Corp. San Diego, CA	Sanders Assoc., Inc. Nashua, NH
Sandia Corp. Livermore, CA	Santa Fe Ry. Chicago, IL	Sarc, Inc. Arlington, VA
School of Hotel Administration Ithaca, NY	Schriever and McKee Washington, DC	Schroder Naess & Thomas New York, NY
Science Applications, Inc. McLean, VA	Scudder, Stevens & Clark New York, NY	Sea & Land Service, Inc. Elizabeth, NJ
Sears, Roebuck & Co. Chicago, IL	Seatrains Lines Edgewater, NJ	Seaway Container Corp. Bound Brook, NJ
Security Pacific National Bank Los Angeles, CA	Seyfarth Shaw Chicago, IL	Shearson Hayden Stone, Inc. New York, NY
Shearson, Hammill & Co. New York, NY	Sheldahl, Inc. Northfield, MN	Shriever and McKee Washington, DC
Siff, Oakley & Marks, Inc. New York, NY	Silkorsky Aircraft Stratford, CT	Simat, Hilliesen & Eichner Newton Centre, MA
Simat, Helliesen & Eichner Washington, DC	Simon & Schuster, Inc. New York, NY	Simpson and Curtin Philadelphia, PA
Singer Co. Binghamton, NY	Skidmore, Owings & Merrill Chicago, IL	Sky Chefs, Inc. New York, NY
A.O. Smith Corp. Milwaukee, WI	Smith, Barney & Co. New York, NY	Wilbur Smith & Assoc. New York, NY
Snively, King & Tucker Washington, DC	Solid State Technology Pt. Washington, NY	SOMET Assoc. Montpelier, VT
Soo Line R.R. Co. Minneapolis, MN	Southern Airways, Inc. Atlanta, GA	Southern Pacific Co. San Francisco, CA
Southern Railway Co. Washington, DC	Southern Ry. Co. Atlanta, GA	R. Dixon Speas Assoc. Munhasset, LI, NY
R. Dixon Speas, Inc. Washington, DC	R. Dixon Speas Assoc, Inc. Lake Success, NY	Spector Freight System Chicago, IL
Spreckels Sugar Co. San Francisco, CA	Squibb Corp. New York, NY	L. H. Cunningham Decatur, IL
Standard & Poor's Corp. New York, NY	Stanley Aviation Corp. Denver, CO	State Street Research & Management Co. Boston, MA
Stein, Roe & Farnham Chicago, IL	Steptoe & Johnson Washington, DC	Stone & Webster Mgt Conslt. New York, NY
Sullivan & Worcester Boston, MA	Summerfield Assoc. Santa Monica, CA	Sun Finance Co. Cleveland, OH
Sun Oil Co. Philadelphia, PA	Sun Ship Bldg. & Dry Dock Chester, PA	Sundstrand Data Control, Inc. Redmond, WA
Swearingen Aircraft San Antonio, TX	Synergy Watsonville, CA	System Design Concepts, Inc. Washington, DC
Systems Development Corp. Santa Monica, CA	Systems Economic Analysis Menlo Park, CA	Systems Technology, Inc. Mountain View, CA
Systems Technology Inc. Hawthorne, CA	T.A.P., Inc. Bozeman, MT	TRW Inc. - CLE Cleveland, OH

#### 4. U.S. BUSINESSES, INDUSTRIES, AND ASSOCIATIONS (Continued)

TRW Systems Group Redondo Beach, CA	Talbert, Cox & Assoc. Charlotte, NC	Technical Economics Associates Estes Park, CO
Technical Research Chicago, IL	Teledyne-CAE Toledo, OH	Teledyne Isotopes, Inc. Timonium, MD
Teledyne Ryan Aeronautical San Diego, CA	Temple, Barker & Sloan Wellesley Hill, MA	Texas Gulf Sulphur Co. Houston, TX
Texas Intern'l Airlines, Inc. Houston, TX	Textron, Inc. Fort Worth, TX	Thiokol Chemical Corp. Huntsville, AL
Thiokol Chemical Corp. Brigham City, UT	3M Company St. Paul, MN	Tidewater Transportation Con Norfolk, VA
Tippetts Abbot & Assoc. Brookline, MA	Tippetts-Abbott-McCarthy-Stratton New York, NY	Torin Corp. Torrington, CT
TRACOR INC. Austin, TX	Traffic & Distr. Servs., Inc. Cambridge, MA	Traffic Service Corp. Washington, DC
Traffic World Magazine Chicago, IL	Trans. Data Committee Washington, DC	Trailer Train Co. Chicago, IL
Trans World Airlines New York, NY	Transit Advertising Assoc. Washington, DC	Transpin Systems Center Cambridge, MA
Aerospace Industries Assoc. of America Washington, DC	Transport Assoc. Silver Spring, MD	Trans. Assn. of America Washington, DC
Trans. Cost Analyst Alexandria, VA	Transp. Research Forum Rockville, MD	Transportation Consultants New York, NY
Travel Demand Forecasting Berkeley, CA	Travel Marketing Consultant Sers. Hicksville, NY	Travel Market Yearbook Stanford, CT
Trayford Transp. Management New York, NY	Trident Engineering Assoc., Inc. Annapolis, MD	Trends Publishing Inc. Washington, DC
The Triskelion Corp. Santa Rosa, CA	Tudor Engineering Co. San Francisco, CA	Ultrasystems, Inc. Phoenix, AZ
Union Barge Line Corp. Pittsburgh, PA	Union Camp Corp. Wayne, NJ	Union Carbide Corp. Paducah, KY
Union Carbide Corp. Oak Ridge, TN	Union Carbide Corp. Tarrytown, NY	Union Dime Savings Bank New York, NY
Union Pacific R.R. Omaha, NB	Union Railroad Co. Pittsburgh, PA	United Acoustic Consultants Glastonbury, CT
United Airlines Chicago, IL	United Air Lines San Francisco, CA	United California Bank Los Angeles, CA
United Missouri Bank of Kansas City Kansas City, MO	United Parcel Service New York, NY	United Parcel Service Washington, DC
United Services Kingman, AZ	U.S. Freight Co. New York, NY	U.S. Gypsum Co. Chicago, IL
U.S. Industries, Inc. New York, NY	United States Leasing Int'l., Inc. San Francisco, CA	U.S. Plywood-Champ Papers Hamilton, OH
U.S. Steel Corp. Pittsburgh, PA	United Technologies Corp. Stratford, CT	United Technologies Corp. W. Palm Beach, FL
United Technologies Corp. East Hartford, CT	United Technologies Corp. Norwalk, CT	Universal Carloading New York, NY
The Urban Institute Washington, DC	Urban Transportation Systems, Assoc. Newton, MA	The Value Line Investment Survey New York, NY
Varo Inertial Products, Inc. Farmington, CT	Sperry Vickers Troy, MI	Virginia National Bank Norfolk, VA
Vistron Corp. Cleveland, OH	Vollmer Associates New York, NY	Volunteer Action Center Gering, Nebraska
Vol. Action Center of Carroll City Westminster, MD	Volunteer Services Program Louisville, KY	Allan M. Voorhees & Assoc., Inc. McLean, VA

4. U.S. BUSINESSES, INDUSTRIES, AND ASSOCIATIONS (Continued)

Vought Corp.  
Dallas, TX

H. C. Wainwright & Co.  
New York, NY

Washington Analysis Corp.  
Washington, DC

Weiss, Peck & Greer  
New York, NY

Westenhoff & Novick Inc.  
Chicago, IL

Western Md. Ry. Co.  
Baltimore, MD

Westinghouse Electric Corp.  
E. Pittsburgh, PA

White Motor Co.  
Cleveland, OH

Wien Air Alaska, Inc.  
Anchorage, AK

Earl I. Wilson & Assoc.  
Canoga Park, CA

Wood, Struthers & Winthrop  
New York, NY

Wyer, Dick & Co.  
Newark, NJ

Yellow Transit Freight  
Kansas City, MO

Wabco Signal & Comm. Div.  
Pittsburgh, PA

Waldo & Edwards, Inc.  
Redondo Beach, CA

Water Transport Assn.  
New York, NY

Wenham Trans. Inc.  
Cleveland, OH

Western Airlines  
San Francisco, CA

Western Pacific R.R. Co.  
San Francisco, CA

Westinghouse Electric Corp.  
W. Mifflin, PA

White, Wild & Co.  
New York, NY

Wilbur Smith Assoc.  
New Haven, CT

Windsor Association  
Dallas, TX

The World Bank  
Washington, DC

Wyle Laboratories  
Huntsville, AL

Warren W. York & Co., Inc.  
Allentown, PA

Wackenhut Systems Corp.  
Coral Gables, FL

Warburg, Paribas & Becker  
New York, NY

Waterways Freight Bureau  
Washington, DC

Wertheim & Co.  
New York, NY

Western Air Lines, Inc.  
Los Angeles, CA

Western Union Space Comm. Inc.  
Saddle Riv, NJ

Wheat First Securities  
Richmond, VA

Herbert O. Whitten & Assoc.  
Annandale, VA

H. W. Williams & Assoc.  
Washington, D.C.

Wood Grindy, Inc.  
New York, NY

Wright Investors Service  
Bridgeport, CT

Xerox Corp.  
Pasadena, CA

Zaromb Research Corp.  
Newark, NJ

# 6. U.S. ACADEMIC, RESEARCH, AND PROFESSIONAL INSTITUTIONS

The University of Akron Akron, OH	Arizona State University Tempe, AZ	University of Arkansas Fayetteville, AR
ARINC Research Corp. Santa Ana, CA	Academy of Aeronautics Flushing, NY	Adler Planetarium Chicago, IL
Aerospace Technological Inst. Independence, MO	Univ. of Alabama University, AL	Univ. of Alabama Huntsville, AL
Albany Med. Coll. of Union Univ Albany, NY	Alliance College Cambridge Springs, PA	American Geophysical Union Washington, DC
American Inst. of Aeronautics & Astro- nautics, Inc. New York, NY	Aeronautical Engineers, Inc. Miami, FL	Amer. Inst. of Aero. & Astro., Inc. Los Angeles, CA
The American University Washington, DC	Amherst College Amherst, MA	Argonne National Laboratories Argonne, IL
Argus Research Corp. New York, NY	Univ. of Arizona Tucson, AZ	Auburn Univ. Auburn, AL
Baruch College New York, NY	Battelle Columbus Labs. Columbus, OH	Boston College Chestnut Hill, MA
Boston University Boston, MA	Univ. of Bridgeport Bridgeport, CT	Brooklyn College Brooklyn, NY
Brown Univ. Providence, RI	Bucknell Univ. Lewisburg, PA	California Inst. of Technology Pasadena, CA
Institute for Transportation Studies Berkeley, CA	University of California Richmond, CA	University of California Davis, CA
California State Univ. Long Beach, CA	U C L A Los Angeles, CA	Univ. of California Los Alamos, NM
Univ. of Southern California Los Angeles, CA	Univ. of California Los Angeles, CA	California State Univ. Northridge Northridge, CA
Carnegie Mellon Univ. Pittsburgh, PA	Case Western Reserve Univ. Cleveland, OH	Univ. of Chicago Chicago, IL
Chico State College Chico, CA	Univ. of Cincinnati Cincinnati, OH	Claremont Colleges Claremont, CA
Clarkson College Potsdam, NY	Clemson Univ. Clemson, SC	Cleveland State Univ. Cleveland, OH
Univ. of Colorado Boulder, CO	Colorado State Univ. Fort Collins, CO	Columbia Univ. New York, NY
Univ. of Connecticut Storrs, CT	Cornell Aeronautical Laboratory Buffalo, NY	Cornell University Ithaca, NY
Dartmouth College Hanover, NH	Del Mar Tech Inst Corpus Christi, TX	Univ. of Denver Denver, CO
Drexel Univ. Philadelphia, PA	Dudley Observatory Latham, NY	Dutchess Community College Poughkeepsie, NY
Env. Action Foundation Washington, DC	Embry Riddle Aeronautical Univ. Daytona Beach, FL	Engineering Societies Library New York, NY
Ensanian Physicochemical Inst. Eldred, PA	Fairfield Univ. Stamford, CT	Fairleigh Dickinson Univ. Teaneck, NJ
Flight Safety Foundation Arlington, VA	Flight Transportation Lab. MIT Cambridge, MA	Florida Institute of Technology Melbourne, FL
Florida International Univ. Miami, FL	Florida Technological Univ. Orlando, FL	Florida State Univ. Tallahassee, FL
Univ. of Florida Gainesville, FL	Fort Hays Kansas State College Hays, KS	Franklin Institute Philadelphia, PA
Garbell Research Foundation San Francisco, CA	University of Georgia Athens, GA	Geneseo State Univ. Geneseo, NY
George Washington University Washington, DC	Georgia Inst. of Tech, Atlanta, GA	Golden Gate College San Francisco, CA
Hartford Graduate Center Hartford, CT	Harvard Business School Boston, MA	Harvard University Cambridge, MA



# 5. U.S. ACADEMIC, RESEARCH, AND PROFESSIONAL INSTITUTIONS (Continued)

Univ. of Hawaii Honolulu, HI	Herbert Lehman College Bronx, NY	Hofstra Univ. Hempstead, NY
Univ. of Houston Houston, TX	Howard Univ. Libraries Washington, DC	Univ. of Idaho Moscow, ID
Idaho State Univ. Pocatello, ID	Southern Illinois Univ. Carbondale, IL	Univ. of Illinois at Urbana Urbana, IL
Univ. of Illinois Chicago, IL	Northern Illinois Univ. DeKalb, ILL	Illinois Wesleyan Univ. Bloomington, IL
Indiana Inst. of Tech. Ft. Wayne, IN	Indiana University Bloomington, IN	Institute for Defense Analysis Arlington, VA
Inst. for Public Trans. New York, NY	Inst. of Public Administration New York, NY	The Inst. on Man & Science Rensselaerville, NY
University of Iowa Iowa City, IA	Iowa State University Ames, IA	John Crerar Library Chicago, IL
Johns Hopkins Univ. Laurel, MD	Johns Hopkins Univ. Baltimore, MD	Joint University Libraries Nashville, TN
Kansas State Univ. Manhattan, KS	Kent State Univ. Kent, OH	Univ. of Kentucky Lexington, KY
Kirkland College Clinton, NY	Letourneau College Longview, TX	Long Island Univ. of Brookville Greenvale, NY
Louisiana Polytechnic Inst. Ruston, LA	Louisiana State Univ. Baton Rouge, LA	Univ. of Maine Orono, ME
Mankato State Univ. Mankato, MN	Marquette Univ. Milwaukee, WI	Univ. of Maryland College Park, MD
Univ. of Massachusetts Amherst, MA	Maxwell School Syracuse, NY	Memphis State Univ. Memphis, TN
Miami Univ. Oxford, OH	Univ. of Michigan Ann Arbor, MI	Michigan State Univ. East Lansing, MI
Univ. of Minnesota Minneapolis, MN	Mississippi State Univ. Miss State, MS	Univ. of Missouri Columbis, MO
Univ. of Missouri Rolla, MO	Montclair State College Upper Montclair, NJ	Univ. of Nevada Reno, NV
New England Aeronautical Inst. Nashua, NH	Univ. of New Hampshire Durham, NH	New Haven College West Haven, CT
New Jersey Inst. of Tech. Newark, NJ	Univ. of New Mexico Albuquerque, NM	New Mexico State Univ. Las Cruces, NM
City College New York, NY	State Univ. of New York Albany, NY	State Univ. of New York Buffalo, NY
New York State College of Ceramics Alfred, NY	State Univ. of New York Fort Schuyler, Bronx, NY	State Univ. of New York Stony Brook, NY
No. Carolina A & T St. Univ. Greensboro, NC	Univ. of North Carolina Chapel Hill, NC	North Carolina State Univ. Raleigh, NC
Northeastern Univ. Boston, MA	Northeastern Univ. Medford, MA	Northwestern Univ. Trans. Ctr. Lib. Evanston, IL
Univ. of Notre Dame Notre Dame, IN	Ohio University Athens, OH	Ohio State Univ. Columbus, OH
Univ. of Oklahoma Norman, OK	Oklahoma State Univ. Stillwater, OK	Oregon State Univ. Corvallis, OR
Penn State Middletown, PA	Penn State Trans. & Tr. Sfty. Ctr University Park, PA	Univ. of Penn Philadelphia, PA
Pepperdine Univ. Los Angeles, CA	Phillips Univ. Enid, OK	Univ. of Pittsburgh Pittsburgh, PA
Polytech Inst. of Brooklyn Brooklyn, NY	Polytech Inst. of New York Farmingdale, NY	Post College, L. I. Long Island, NY
Princeton Univ. Princeton, NJ	Providence College Providence, RI	Purdue Univ. West Lafayette, IN

# 5. U.S. ACADEMIC, RESEARCH, AND PROFESSIONAL INSTITUTIONS (Continued)

Rensselaer Polytechnic Institute Troy, NY	Univ. of Rhode Island Kingston, RI	Rochester Inst. of Tech. Rochester, NY
Univ. of Rochester Rochester, NY	Rose Polytechnic Inst. Terre Haute, IN	Rutgers Univ. New Brunswick, NJ
St. Louis Univ. St. Louis, MO	San Antonio College San Antonio, TX	San Diego State Univ. San Diego, CA
San Jose State Univ. San Jose, CA	San Francisco State College San Francisco, CA	Univ. of Santa Clara Santa Clara, CA
Smithsonian Nat'l Air & Space Mus. Washington, DC	Univ. of South Carolina Columbia, SC	Southeastern Mass Univ. North Dartmouth, MA
Southeastern Oklahoma State Univ. Durant, OK	Southern Illinois University Carbondale, IL	Southern Research Institute Birmingham, AL
Southwest Research Institute San Antonio, TX	Stanford Univ. Stanford, CA	Stanford Research Inst. Menlo Park, CA
Inst. of Urban Transportation Syracuse, NY	Temple Univ. Philadelphia, PA	Univ. Tenn. Transportation Ctr. Nashville, TN
Texas Transportation Inst. College Station, TX	Texas State Technical Inst. Waco, TX	Texas Tech. Univ. Lubbock, TX
Univ. of Texas at Arlington Arlington, TX	University of Texas Austin, TX	Univ. of Toledo Toledo, OH
United Tech. Research Center East Hartford, CT	Tri State Univ. Angola, IN	Troy State College Troy, AL
Tulane Univ. Library New Orleans, LA	Univ. of Tulsa Tulsa, OK	Union College Schenectady, NY
Utah State Univ. Logan, UT	Univ. of Utah Salt Lake City, UT	Vanderbilt Univ. Nashville, TN
University of Virginia Charlottesville, VA	Univ. of Washington Seattle, WA	Washington Univ. St. Louis, MO
Washington State Univ. Pullman, WA	Wayne State Univ. Detroit, MI	Wesleyan Univ. Middletown, CT
West Virginia Univ. Morgantown, WV	Western Michigan Univ. Kalamazoo, MI	Wichita State Univ. Wichita, KS
Univ. of Wisconsin Madison, WI	Univ. of Wisconsin Milwaukee, WI	Univ. of Wisconsin Green Bay, WI
Worcester Polytechnic Inst. Worcester, MA	Yale Univ. New Haven, CT	

## 6. NON-U.S. AND INTERNATIONAL ORGANIZATIONS

Univ. of Adelaide Adelaide, South Australia	Adviesburg Voor Verkeersordening Deventer, Holland	Air Canada Montreal, Que., Canada
Air Canada Malton, Ont., Canada	Air Canada Dorval Int'l Airport, Que., Canada	Air Finance, Int'l, Inc. Elk Grove Village, IL
Air Transport Bureau Montreal, Que., Canada	Air France Paris, France	Airlift Int'l, Inc. Washington, DC
Alberta Policy Plng & Research Edmonton, Alberta, Canada	Alcan Shipping Services Montreal, Que., Canada	Alcan Port Alfred, Que., Canada
Alcan Toronto, Ont., Canada	Algoma Central Ry Sault St. Marie, Ont., Canada	Alistair Tucker Assoc. London, England
Aluminum Co. of Canada Montreal, Que., Canada	Aluminum Lab Ltd Knoqston, Ont., Canada	Amenage Urbain Delaville Montreal, Que., Canada
Austrian Airlines Schwarzenberg Platz, Austria	Auto Trans. Assn. of B.C. Burnaby, B.C., Canada	Aviation Planning Ser. Ltd. Montreal, Que., Canada
Aviation Statistics Centre Ottawa, Ont., Canada	B. A. & H. Canada, Ltd. Toronto, Ont., Canada	Peter Barnard Associates Toronto, Ont., Canada
Barristers & Solicitors Ottawa, Ont., Canada	Ben Gurion University of the Negev Beer-Sheva, Israel	Beauchemin, Beaton, LaPoint Montreal, Que., Canada
Univ. of Birmingham Birmingham, England	Univ. of Bristol Bristol, England	British Aircraft Corp. Wlybridge, Surrey, England
British Airways New York, NY	B.C. Inst. of Technology Barnaby, BC, Canada	B. C. Maritime Employers Vancouver, BC, Canada
B. C. Tree Fruits, Ltd. Kelowna, B. C., Canada	Univ. of British Columbia Vancouver, B.C., Canada	British Embassy Washington, DC
British Interplanetary Society, Ltd. London, SW, England	British Library Wetherby, Yorkshire, England	Brown & Ryan, Ltd. Montreal, Que., Canada
Bruinette Kruger & Assoc. Braamfontein, South Africa	Bundesanstalt fur Flugsicherung Frankfurt (Main), Germany	Burlington Dept. of Transp. & Comm. Burlington, Ont., Canada
Buro Goudappel & Coffeng BV Deventer, The Netherlands	C. P. Air Vancouver, B.C., Canada	Univ. of Calgary Calgary, Alberta, Canada
Canada Pl. Division Western Reg. Calgary, Alberta, Canada	The Canada Systems Group Mississauga, Ont., Canada	Canadian Auto Trans. Ottawa, Ont., Canada
Canadian Chamber of Shipping Ottawa, Ont., Canada	Canadian Defense Research Staff Washington, DC	Canadian Good Roads Assn. Ottawa, Ont., Canada
Canadian Gen. Transit Co. Montreal, PQ, Canada	Canadian Imperial Bank of Commerce Toronto, Ont., Canada	Canadian Industries Ltd. Montreal, Que., Canada
Canadian Ind. Traffic League Toronto, Ont., Canada	Canadian I C A O Montreal, PQ, Canada	Canadian Manufacturers Assoc. Toronto, Ont., Canada
Canadian Motor Coach Assn. Toronto, Ont., Canada	Canadian Nat'l Rys. Montreal, Que., Canada	Canadian National Rys. Toronto, Ont., Canada
Can-Lease Transp. Equip. Montreal, Que., Canada	Canadian National Railway Edmonton, Alberta, Canada	CN Terminal Bldg., Moncton, NB, Canada
Canadian Overseas Shipping Montreal, Que., Canada	Canadian Pacific Express Toronto, Ont., Canada	Canadian Pacific Rys. Vancouver, BC, Canada
Canadian Pacific Ry. Co. Montreal, P.Q., Canada	Canadian Ry. Labour Assn. Ottawa, Ont., Canada	Can. Surface Trans. Admin. Ottawa, Ont., Canada
Canadian Timken, Ltd. Dorval, Que., Canada	Canadian Trailmobile Ltd Brantford, Ont., Canada	Canadian Transport Comm. Ottawa, Ont., Canada
Canadian Dept. of Trans. Ottawa, Ont., Canada	Canadian Trucking Assn. Ottawa, Ont., Canada	Carleton Univ. Ottawa, Ont., Canada
D. W. Carr & Assoc. Ottawa, Ont., Canada	Central Organization TNO Delft, The Netherlands	Centre de Documentation de L'Armement Paris, France
Centre National D'Etudes Spatiales Toulouse, France	Chartered Institute of Transport London, England	Chevalier Associates Montreal, Que., Canada



## 6. NON-U.S. AND INTERNATIONAL ORGANIZATIONS (Continued)

Civil Aviation Branch Ottawa, Ont., Canada	Civil Aviation Authority London, England	Civil Aviation Department New Delhi, India
Clarke Traffic Services Montreal, Que., Canada	Cominco, Ltd Montreal, Que., Canada	Comision Nacional de Investigaciones Buenos Aires, Argentina
Consiglio Nazionale Delle Ricerche Roma, Italia	Consolidated Equipment Co. Montreal, Que., Canada	Cranfield Institute of Technology Cranfield Bedford, England
Dalhousie University Halifax, NS, Canada	Danish Defence Research Board Kobenhavn, Denmark	Danmarks Tekniske Bibliotek Lyngby, Denmark
Davis & Co. Vancouver, BC, Canada	De Ieuw Cather Canada, Ltd. London, Ont., Canada	Delft University of Technology Delft, Holland
Department of Defence Adelaide, SA, Australia	Department of Defence Melbourne, Victoria, Australia	DFVLB Zentrastelle Fuer Luft-U Raumfahrt Muenchen, Western Germany
M. M. Dillon, Ltd Ottawa, Ont., Canada	Direccion General Aeronautica Civil Mexico de Mexico	Directorate of Civil Aviation Oslo, Norway
Direction Generale de l'Aviation Civile Paris, France	Dominion Foundries & Steel Hamilton, Ont., Canada	Downsview Dept. of Transport Downsview, Ont., Canada
ERCO Chemicals Toronto, Ont., Canada	Eastern Canada Stevedoring Montreal, Que., Canada	Eastern Provincial Airway Duvernay, PQ, Canada
Eastern Provincial Airway Montreal, Que., Canada	T. Eaton Co., Ltd. Toronto, Ont., Canada	Univ. of Edinburgh Edinburgh, Scotland
City Planning Dept. Edmonton, Alberta, Canada	Egyptair Cairo, Egypt	Eurocontrol Bruxelles, Belgium
Falconbridge Nickel Mines Toronto, Ont., Canada	Fed. Comm. & Nav. Co., Ltd. Montreal, Que., Canada	First National City Bank Manila, Philippines
Fokker-VFW International BV The Netherlands	Dept. of Econ. Growth Fredericton, NB, Canada	French Embassy Washington, DC
Fruehauf Trailer Co. Quebec, Quebec, Canada	Fuschino & Assoc. Ltd. Levis, Quebec, Canada	Univ. of East Anglia Norwich, England
Gendron Lefebvre & Assoc. Chomedey, Que., Canada	German & Milne Montreal, Que., Canada	Gibson Shipbrokers, Ltd Montreal, Que., Canada
Goliad Oil & Gas Co. Calgary, Alberta, Canada	Goodchild Research Studies Burnside, South Australia	Greater Vancouver Reg. Dist. Vancouver, BC, Canada
Government of Canada Manotick, Ont., Canada	Halco, Ltd. Halifax, NS, Canada	Halifax-Dartmouth Port Halifax, NS, Canada
Dept. of Develop & Ind. Serv. Halifax, NS, Canada	Hamilton St. Ry. Co. Hamilton, Ont., Canada	Hawker, Siddeley, Canada Montreal, Que., Canada
Hebrew Univ. Jerusalem, Israel	Hedlin, Menzies & Assoc. Toronto, Ont., Canada	C. D. Howe Co., Ltd Thunder Bay, Ont., Canada
Howe International Montreal, Que., Canada	I B C Holden, Ltd. Montreal, Que., Canada	I B I Group Toronto, Ont., Canada
Imperial Air Ltd Toronto, Ont. Candad	Imperial Oil Ltd Toronto, Ont., Canada	Imperial College of Science & Tech London, England
Ind. Trade Traffic SERV. Ottawa, Ont.	Indian Airlines Corp. New Delhi, India	Indian Institute of Science Lib. Bangalore, India
Indian Institute of Technology Madras, India	Indian and Northern Affairs Calgary, Alberta, Canada	Indian Space Research Organization Bangalore, India
Indonesian National Aero. & Space Inst. Djakarta, Indonesia	Ineco Director General Madrid, Spain	Institute of Air Transport Paris, France
Instituto de Pesquisas Espaciais Sao Paulo, Brazil	Inst. for Road Safety Research SWOV Voorburg, Holland	The Chartered Inst. of Transport London, England
Madrid Space Station Madrid, Spain	Int'l Federation of Airline Pilots London, England	Israel Inst. of Tech. Haifa, Israel



## 6. NON-U.S. AND INTERNATIONAL ORGANIZATIONS (Continued)

International Air Transport Assn. Geneva, Switzerland	Int'l Brotherhood of Teamsters Washington, DC	Int'l Civil Aviation Organization Montreal, Que. Canada
Int'l Surveys, Ltd Montreal, Que., Canada	Int'l Air Transport Assoc of Amer. Washington, D.C.	Japan Informa. Center of Science & Tech Jamaica, NY
Johnston Terminals Vancouver, BC, Canada	KLM Royal Dutch Airlines Schiphol Airport, The Netherlands	Kobenhavns Universitet Kobenhavn, Denmark
Kates, Peat, Marwick & Co. Toronto, Ont., Canada	Kates, Peat, Marwick Montreal, Que., Canada	Laborde Simat Ltd Calgary, Alberta, Canada
Lalonde Valois Lamarre Montreal, Que., Canada	Bibliotheque Universite Laval Quebec, Que, Canada	University of Leeds Leeds, England
Lever Bros. Ltd Toronto, Ont., Canada	Univ. of Leicester Leicester, England	N.D. Lea & Assoc. Oakville, Ont., Canada
N. D. Lea & Assoc. Vancouver, BC, Canada	Transad House London, England	Loughborough Univ. of Tech. Loughborough, Leicestershire, Eng.
Universidad de Los Andes Bogota, DE, Columbia	Lufthansa German Airlines Airport, Hamburg, W. Germany	MLW-Worthington, Ltd Montreal, PQ, Canada
Macquarie University Sydney, NSW, Australia	Del Area Met De Madrid-Cidam Madrid, Spain	Univ. of Manchester Manchester, England
University of Manitoba Winnipeg, Manitoba, Canada	March Shipping Ltd Montreal, Que., Canada	Adm. Voie Maritim St. Larnt Ottawa, Ont., Canada
Maritime Trans. Comm. Moncton, NB, Canada	Marketing Services Montreal, Que., Canada	Universite D'Aix-Marseille Marseille, France
McAllister Towing Ltd Montreal, Que., Canada	McDougall Consultants Kingston, Ont., Canada	McGill University Montreal, Que., Canada
McMaster Univ. Hamilton, Ont., Canada	Melbourne Dept. of Transport Melbourne, Australia	M. W. Menzies Group Ltd Winnipeg, Manitoba
Metra-Service Paris, France	Metro Plan Review Toronto, Ont., Canada	Middle East Airlines Bierut, Lebanon
Middle East Tech Univ. Ankara, Turkey	Ministry of Defence Orpington, Kent, England	Ministry of State Ottawa, Ont., Canada
Ministry of Transport Ottawa, Ont., Canada	Ministerie van Economische Zaken 'S-Gravenhage, The Netherlands	Ministry of Transport & Comm. Toronto, Ont., Canada
Mitsubishi Heavy Industries Ltd Tokyo, Japan	Monsanto Canada Ltd Montreal, Quebec, Canada	New Montreal Inter Airport Montreal, Quebec, Canada
Montreal Port Council Montreal, Que., Canada	Montreal Shipping Co. Montreal, Que., Canada	Univ. de Montreal Montreal, Que., Canada
Nagoya Univ. Chikusa-Ku Nagoya-Shi Japan	National Aeronautical Laboratory Bangalore, India	National Aerospace Laboratory Chofu-City, Tokyo, Japan
National Aerospace Laboratory NLR Amsterdam, The Netherlands	National Development Agency of Japan Minato-Ku Tokyo, Japan	Natl. Harbours Bd. Ottawa, Ont., Canada
National Harbours Board Montreal, PQ, Canada	National Research Council Ottawa, Canada	National Steel Car Corp. Hamilton, Ont., Canada
National Steel Car Corp. Montreal, Que., Canada	Netherlands Armed Forces The Hague, The Netherlands	Univ. of New South Wales Kensington, NSW, Australia
Memorial Univ. of Newfoundland St. Johns, Newfoundland, Canada	Newfoundland Steamships Halifax, NS, Canada	Nordair Ltd Dorval, PQ, Canada
Norsk Senter for Informatikk NSI Oslo, Norway	Northern Transp. Co. Edmonton, Alberta, Canada	Observatorio Astronomico Nacional Bogota, Colombia
Osgoode Hall Law School Downsville, Ont., Canada	Ottawa Dept. of No. Affairs Ottawa, Ont., Canada	Ottawa Dept. of Supply & Serv. Ottawa, Ont., Canada
Ottawa Dept. Mines & Tech. Surveys Ottawa, Ont., Canada	Ottawa Dept. of Industry Ottawa, Ont., Canada	Dept. of Supply & Services Ottawa, Ont., Canada
Dept of Urban Planning Toronto, Ont., Canada	Ontario Min of Trans. & Communications Downsview, Ont., Canada	Dept. of Finance Ottawa, Ont., Canada
Operational Research Ruislip, Middlesex, England	Airport Planning & Research Ottawa, Ont., Canada	Air Transport Committee Ottawa, Ont., Canada

## 6. NON-U.S. AND INTERNATIONAL ORGANIZATIONS (Continued)

A. C. Parker & Assoc. Hamilton, Ont., Canada	Physical Research Laboratory Ahmedabad, India	Politecnico di Torino Istituto Torino, Italia
Procar, Ltd. Montreal, Que., Canada	Procor, Ltd. Oakville, Ont., Canada	Provost Cartage, Inc. Anjou, Que., Canada
Qantas Airways, Ltd. Sydney, Australia	Canadian Inst. of Guided Ground Trspt Kingston, Ont., Canada	Quebec & Ontario Trans. Co. Montreal, Que., Canada
Quebec Iron & Titanium Sorel, P.Q., Canada	Quebec Tariff Bureau, IOC Montreal, P.Q., Canada	RAAF Academy Point Cook, Victoria, Australia
Railway Assn. of Canada Montreal, Que., Canada	Read, Voorhees & Assoc. Don Mills, Ont., Canada	Regina Dept. of Municipal Affairs Regina, Sask., Canada
Regina Transit System Regina, Sask., Canada	Resource Devel. Assoc. Ltd Winnipeg, Man., Canada	Director of Civil Aviation Reykjavik Airport, Iceland
Roads & Trspt Assoc. of Canada Ottawa, Ont., Canada	Rolls-Royce Ltd Derby, England	Ronsco Supply Co. Montreal, Que., Canada
Royal Aeronautical Society London, England	Royal Aircraft Establishment Farnborough, Hampshire, England	Royal Radar Establishment Malvern, Worcestershire, England
Ministry of Civil Aviation Moscow, USSR	Saguenay Shipping, Ltd. Montreal, Que., Canada	St. Lawrence Seaway Authority Cornwall, Ont., Canada
St. Lawrence Seaway Ottawa, Ont., Canada	Saskatchewan Dept. of Hwy. Trans. Regina, Sask., Canada	University of Saskatchewan Regina, Sask., Canada
University of Saskatchewan Saskatoon, Sask., Canada	Satra Montreal, Que., Canada	Saudia Airlines Saudi, Arabia
Scandinavian Airlines System Stockholm, Sweden	Scarborough College, Univ. of Toronto West Hill, Ont., Canada	Science Council of Canada Ottawa, Ont., Canada
Seaspan International Ltd. Montreal, Que., Canada	Seaboard Shipping Co. Vancouver, BC, Canada	J. P. Sharp Associates, Ltd. Toronto, Ont., Canada
Simon Fraser Univ. Burnaby, BC, Canada	Simpsons-Sears Ltd. Toronto, Ont., Canada	Siroplex Co. Montreal, Que., Canada
Wilbur Smith Associates Toronto, Ont., Canada	Soo Security Regina, Sask., Canada	SORES, INC. Montreal, Que., Canada
Soulanges Cartage & Equip. Montreal, Que., Canada	South African Council for Scientific & Industrial Research Pretoria, South Africa	Staunton Transpt Dev Agency Staunton, Canada
Air Ministry Madrid, Spain	SRI-DC Colombo, Republic of Sri Lanka	Statistics Canada Ottawa, Ont., Canada
Steel Co. of Canada, Ltd. Hamilton, Ont., Canada	W. Strok & Assoc. Toronto, Ont., Canada	Swan Wooster Eng'l. Co. Vancouver, BC, Canada
Swedish Defence Material Admin. Stockholm, Sweden	Univ. of Sydney Sydney, NSW, Australia	Technische Hogeschool-Delft Delft, The Netherlands
Univ. of Thessaloniki Thessaloniki, Greece	Tokyo Astronomical Observatory Tokyo, Japan	Univ. of Tokyo Tokyo, Japan
J. M. Tomlinson & Assoc. Burlington, Ont., Canada	Toronto Area Transit Operating Auth. Downsview, Ont., Canada	Univ. of Toronto Downsview, Ont., Canada
Tracked Hovercraft Ltd. Cambridge, England	Traffic Engineering & Control London, England	Transport Canada - Air Planning Ottawa, Ont., Canada
Transport Policy & Research Ottawa, Ont., Canada	Dept. of Transport Victoria, BC, Canada	Transport & Econ. Research Croydon, Surrey, England
Trans. Mt. Oil Pipe Line Co. Vancouver, BC, Canada	Transport Assoc. of Ontario Rexdale, Ont., Canada	Transportation Development Agency Montreal, Que., Canada
Transport & Rd Rsch Lab. Crowthorne, Berkshire, England	Trans. Res. & Dev. Division Edmonton, Alberta, Canada	Trimac, Ltd. Calgary, Alberta, Canada
H. M. Trimble & Sons Ltd. Calgary, Alberta, Canada	Trucking Assoc. of Quebec Montreal, Que., Canada	Outer Space Affairs Group-UN New York, NY
UN - Transport Section New York, NY	Van Ginkel Assoc. Ltd. Montreal, Que., Canada	Vancouver Wharves N. Vancouver, BC, Canada

6. NON-U.S. AND INTERNATIONAL ORGANIZATIONS (Continued)

Universidad Central de Venezuela  
Caracas, Venezuela

Univ. of Waterloo  
Waterloo, Ont., Canada

Univ. of Winnipeg  
Winnipeg, Man., Canada

Zurich Ing Buro  
Zurich, Switzerland

Von Karman Inst. for Fluid Dynamics  
Rhode St. Genese, Belgium

Weldwood of Canada, Ltd.  
Vancouver, BC, Canada

Univ. of the Witwatersrand  
Johannesburg, South Africa

F. K. Warren, Ltd.  
Halifax, NS, Canada

Whiteknights  
Reading, England

York University  
Downsview, Ont., Canada